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ANALYSIS OF CONTRACTING METHODS EMPLOYED IN THE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION PROGRAM

by

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December 1998

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The Advanced Concept Technology Demonstration (ACTD) Program, initiated by DoD as a joint acquisition and warfighting community effort, is intended to exploit mature and maturing technologies to assist in solving identified military needs. The focus of the research is to examine the ACTD Program, its three classes and the contracting methods employed in each class. The objective of this research is to determine if contracting methodology is a critical decision element in the ACTD process and provide recommendations for Government contracting personnel in contracting for future ACTDs. This study compares and contrasts procurements through the formal acquisition process to those via the ACTD Program. Additionally, major ACTD outcomes, issues, challenges and lessons learned are analyzed to assess how they may impact the contracting process. Due to the highly diverse nature of ACTD systems, the choice or prescription of a particular contract method was not found to be a critical process element. The ACTD process should remain flexible to achieve the objectives for which it was established. Contracting officials should be encouraged to tailor the acquisition process to the needs of the particular programs, minimize cost, schedule and performance risks and incentivize contractor performance to the maximum extent possible.

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ANALYSIS OF CONTRACTING METHODS EMPLOYED IN THE ADVANCED CONCEPT TECHNOLOGY DEMONSTRATION PROGRAM

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ABSTRACT

The Advanced Concept Technology Demonstration (ACTD) Program, initiated by DoD as a joint acquisition and warfighting community effort, is intended to exploit mature and maturing technologies to assist in solving identified military needs. The focus of the research is to examine the ACTD Program, its three classes and the contracting methods employed in each class. The objective of this research is to determine if contracting methodology is a critical decision element in the ACTD process and provide recommendations for Government contracting personnel in contracting for future ACTDs. This study compares and contrasts procurements through the formal acquisition process to those via the ACTD Program. Additionally, major ACTD outcomes, issues, challenges and lessons learned are analyzed to assess how they may impact the contracting process. Due to the highly diverse nature of ACTD systems, the choice or prescription of a particular contract method was not found to be a critical process element. The ACTD process should remain flexible to achieve the objectives for which it was established. Contracting officials should be encouraged to tailor the acquisition process to the needs of the particular programs, minimize cost, schedule and performance risks and incentivize contractor performance to the maximum extent possible.

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I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to examine the contracting methods employed by the Department of Defense (DoD) in the three defined classes of Advanced Concept Technology Demonstration (ACTD) Programs and determine if contracting methodology is a critical decision element in the ACTD process. Each class of ACTD's unique characteristics, lessons learned, procedural and decision processes, and actual or predicted outcomes are considered and used to evaluate the contracting methods employed by DoD in ACTD programs. The reasons for use and relative success or failure of these methods are assessed to determine if they are required or should be recommended for use in future programs. Additionally, this analysis is used to develop some general guidelines and recommendations for Government Contracting Officers.

B. BACKGROUND

The Advanced Concept Technology Demonstration (ACTD) program was initiated by the DoD in early 1994 based on recommendations made by the Defense Science Board and Packard Commission. The concept allows the Government to receive an item or system and assess its performance in the field prior to an acquisition decision. As stated by the Packard Commission, the ACTD program seeks to "fly and know how much it costs before we buy". [Ref. 26:p. 1]

The ACTD program permits an early and inexpensive evaluation of a mature advanced technology by the warfighter to determine its military utility. The goal of the program is to assess new military utilities under conditions on a scale sufficient to clearly establish operational functionality and system integrity. The procurement process is

designed to be a joint effort between the warfighting (operational) and acquisition communities within DoD.

The thrust of the ACTD program is to provide near-term responses to validated joint military needs. The responses to these military needs are usually technology-based and must be affordable, interoperable, sustainable, and capable of evolution. The demonstrated items or systems are retained by the warfighter for continued use and/or development to adapt to the changing technology or threat.

C. RESEARCH OBJECTIVES

1. Primary Research Question

The technological nature and uncertain outcome of Advanced Concept Technology Demonstrations (ACTDs) present unique challenges for Government Contracting Officers but is the choice of a particular contracting method really critical to the ACTD process?

2. Secondary Research Questions

(1) What is the traditional acquisition process and what are the relative benefits and disadvantages currently attributed to that process?

(2) What is an ACTD?

(3) How does the ACTD acquisition process differ from the traditional acquisition?

(4) What are the principal issues involved in the transition of ACTDs and how are they being addressed?

(5) What, if any, general contracting method recommendations or guidelines for Government Contracting Officers can be derived from completed and current ACTD programs?

D. DISCUSSION

The past decade has seen true acquisition reform measures taken in an effort to overcome budgetary constraints and ever-changing military missions and threats. Many key reform areas have addressed the need to streamline the procurement process while others are designed to reduce costs to meet the mandate to "do more with less". One such measure taken that has improved each of these reform areas is the validation and implementation of the Advanced Concept Technology Demonstration (ACTD) Program.

In early 1994, the Department of Defense (DoD) created the ACTD program to help speed the transition of maturing technology from developers to warfighting users. This program and process has quickly become, according to Dr. Paul G. Kaminski, then the Under Secretary of Defense for Acquisition and Technology {USD(A&T)}, "one of the fundamental core elements in improving our acquisition system". [Ref. 43:p. 1] The ACTD program involves many elements of today's acquisition reform initiatives. As mentioned before, ACTDs help to streamline the acquisition process while cutting costs. They are a break from the traditional approach under which a developer first develops then produces and subsequently delivers the product to the end user. ACTD programs take full advantage of the Integrated Product and Process Development (IPPD) approach and involve joint Service cooperation to afford the warfighting end user the opportunity to perform early and extensive operational assessments of the product before a great deal of funds are invested in the project. Additionally, upon completion of the ACTD there is

usually some residual operational capability that might be utilized even if it is decided that the program is not yet ready to go into the full development production.

ACTD programs were initially viewed as having a nominal duration of two to four years for transition to a user-operated system and acquisition program. Now, in 1998, DoD is nearing the end of the expected completion cycle for the first ACTDs approved in 1995. This study concentrates on the use of the different contracting methods used in the three classes of the Department of Defense (DoD) ACTD Program and examines them for their relative success or failure. Each class of ACTD's unique characteristics, procedural and decision processes, and actual or predicted outcomes is considered and used to evaluate contracting methods employed by DoD in ACTD programs.

E. SCOPE, AUDIENCE AND BENEFITS OF THESIS

The scope of this thesis includes: (1) a review of the formal acquisition process; (2) an examination of various ACTD program's processes and procedures; (3) a contrast and comparison of ACTD processes with normal acquisition procedures; (4) an analysis of the current issues involved in ACTD programs; and (5) an examination of the ACTD program classes for contracting methods that are being, and can be, applied by Government Contracting Officers in current and future ACTD program acquisitions.

The audience for this thesis includes DoD policy makers, program managers, and contracting officers. The emphasis of this thesis is to examine the contracting methods that are and may be used in the three classes of ACTDs. These methods are used to formulate general contracting method guidelines and recommendations for use in future ACTDs. It is hoped that this research and the resulting analysis and recommendations

might assist Government and industry contracting personnel make more informed ACTD acquisition decisions.

F. METHODOLOGY OF RESEARCH

The methodology used in this thesis consists of the following:

1. Conduct a literature search of books, magazine articles, Federal regulations, case studies, CD-ROM system literature, Internet, and Dudley Knox and Acquisition library information resources at the Naval Postgraduate School regarding the topic of current and previous ACTDs.
2. Conduct a thorough review of the standard formal acquisition process and compare that process with the ACTD acquisition process.
3. Conduct electronic mail correspondence as well as personal and phone interviews of key personnel involved in completed and current ACTDs and ACTD initiatives to ascertain further insight into ACTD processes, challenges, and lessons learned. Conduct these interviews with a non-attribution option to allow for a more informative critique of ongoing programs.
4. Identify procedural requirements for the introduction and implementation of an ACTD program.
5. Obtain and analyze various contracting methods employed in each of the three classes of ACTDs to assess trends of use and their relative success or failure in addressing the challenges presented by ACTD objectives and any previous lessons learned.

6. Evaluate the benefits and disadvantages of employing various contracting methods in ACTDs.

7. Prepare standard contracting method guidelines for each ACTD class through transition to general acquisition programs.

G. LIMITATIONS

The ACTD program was created in 1994 with ACTDs typically slated for a two-to-four year period for execution of the demonstration. The first of the ACTDs were initiated in early 1995. These and other ACTDs are just now at or near the end of the demonstration phase. With an evolving program such as the ACTD program there are various and differing reports of performance in the early years. Many program elements and contracting methods employed are varied and are, to an extent, unproven due to the recent creation of the program.

Throughout the research phase of this thesis, this researcher sought to assemble as complete and unbiased information as possible. In this endeavor, many interviews of various stakeholders in the ACTD process were conducted. The interviewees were given the option to hold the interview on a non- attribution basis to elicit the most honest and forthcoming ideas, opinions, lessons learned, suggestions and criticisms involving the ACTD process.

H. ORGANIZATION

Chapter II of this study provides an introduction to the traditional formal acquisition process and its relative advantages and disadvantages. This chapter also introduces the Advanced Concept Technology Demonstration program, its process and

procedures. Following their introduction, the processes of the formal and ACTD acquisition programs are compared and contrasted.

Chapter III examines the possible ACTD outcomes, testing issues and challenges associated with the transition to formal acquisition. Also discussed are some of the lessons learned from the various ACTD programs and how they may impact the contracting process.

Chapter IV provides a detailed analysis of the three classes of ACTDs. Examples of each class are delineated and discussed. Following the description of each ACTD class, a thorough discussion is conducted of the various contracting methods that have been, are being or could be utilized to facilitate the execution of the ACTDs. The reasons for use and relative success or failure of these methods are assessed to determine if the methodology is critical or mandatory to properly execute current or future programs.

Chapter V provides a summary of the previous chapters' research, analysis and findings. The primary and secondary research questions are answered based upon the findings of this study. Additionally, this chapter provides guidelines and recommendations that might be employed by Government contracting personnel in contracting for future ACTDs. Finally, this chapter lists areas for further ACTD research.

II. BACKGROUND ON ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS

A. INTRODUCTION

It should be noted from the outset that the ACTD process is not a substitute for a traditional, formal acquisition program. The traditional defense acquisition process remains the principal method for procuring new and upgraded military capabilities. The ACTD process was intended to be, and has become, a pre-acquisition activity and facilitating element to the formal process. [Ref. 66: p. 1]

B. ACTD DESCRIPTION

An ACTD is a joint effort between the acquisition and warfighting communities and is intended to exploit mature and maturing technologies to assist in solving identified military needs and problems. The major point of emphasis is to provide quick responses to validated military requirements. [Ref. 35:p. 1] There is an ever-increasing need to respond to rapidly evolving military requirements due to shrinking budgets, rapid and major changes in foreign threats, and fast-paced development of technology that is more readily available to potential adversaries. [Ref. 40,p. 1]

ACTDs provide the warfighting end-user an opportunity to assess the military capability of established elements of a mature technology toward the resolution of a stated military need. The establishment of military capability, or lack thereof, is then used in the decisions of whether to proceed with a formal acquisition process and, if so, where the entry point should be in that process. [Ref. 35:p. 1]

C. TRADITIONAL DEFENSE ACQUISITION PROCESS

1. Background

When the Office of Management and Budget (OMB) issued Circular No. A-109, *Major System Acquisition*, in 1976 it established a policy that would govern the acquisition of major systems in all executive branch agencies, including the Department of Defense (DoD). OMB identified major acquisition programs as those that:

* are directed at and critical to fulfilling an agency mission,
* entail the allocation of relatively large resources, and
* warrant special management attention.

The various Circular A-109 policies and procedures relevant to Government agencies and departments in acquiring defense systems were delineated and implemented by the Federal Acquisition Regulation (FAR) Part 34, *Major System Acquisition.* Further policies and procedures intended for DoD are provided in DoD Directive 5000.1, *Defense Acquisition,* and DoD Regulation 5000.2R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information System (MAIS) Acquisition Programs.* These two documents were issued in 1996 and incorporate some of the initiatives of the Federal Acquisition Streamlining Act (FASA), representing a "major departure in purpose, format content and scope from their predecessors". (Ref. 14:p. 16)

2. Process

a. *Initiation*

The establishment of any major defense program begins with a determination of the DoD mission. After this analysis there must be a determination of

mission needs. The issue of what is needed to carry out the established mission becomes paramount. [Ref. 59:pp. 1, 5] As discussed below, this determination involves the various stakeholders in the process and, as much as possible, industry.

While more recent directives have been published governing DoD-specific acquisitions, the basic model for the initiation and phases of major systems acquisition are still presented by OMB Circular A-109. The following model (Figure 1) represents a complex acquisition process and is intended to apply to major projects. The model, created by Professor Stanley N. Sherman, summarizes the main phases and decisions that Government agencies must include in their acquisition strategies. [Ref. 74:p. 227]

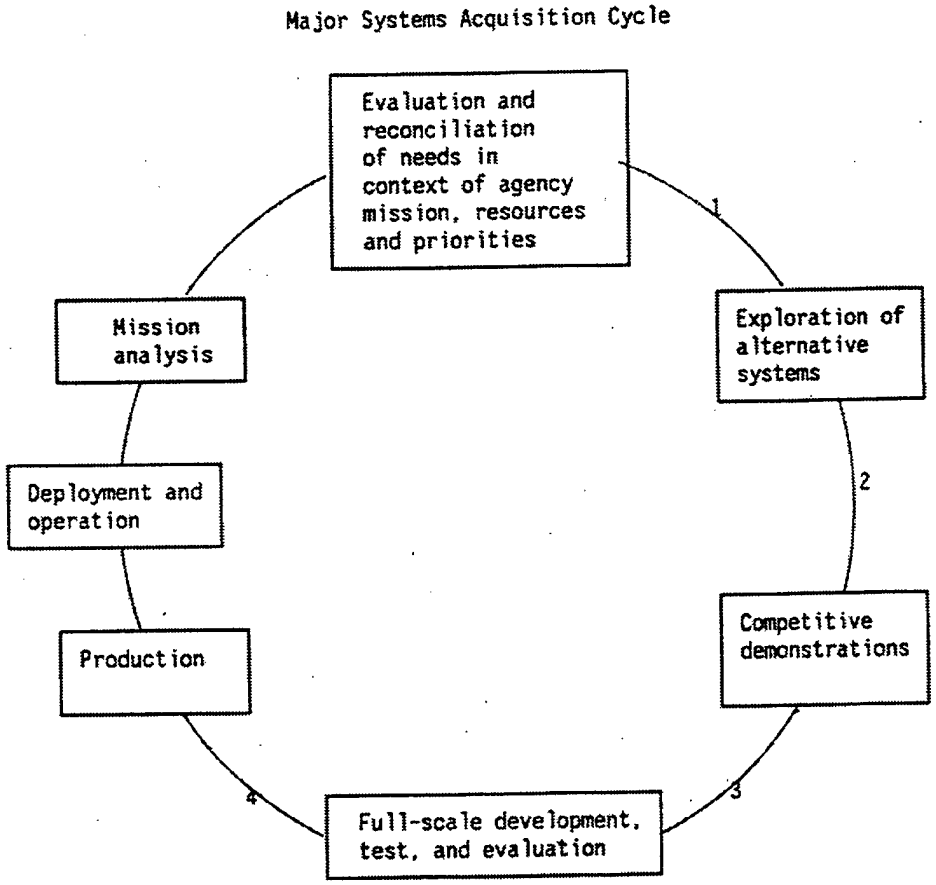


Figure 1: Major Systems Acquisition Cycle

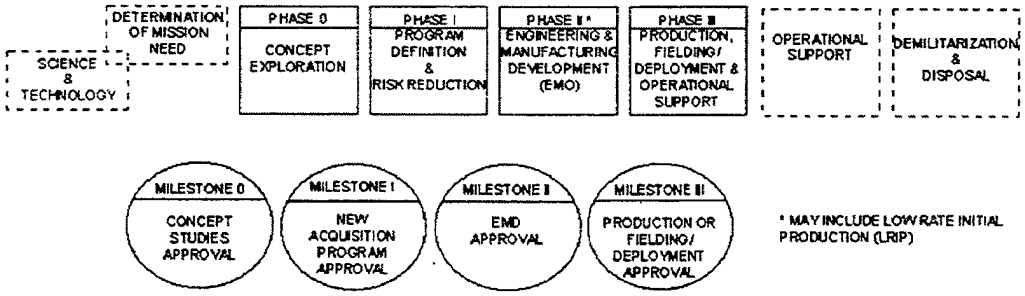
The emphasis of the Circular A-109 model is to stress the early and integrated involvement of management in determining mission needs and goals and the direction that research and development efforts should take to achieve them. Integrated efforts are also tasked with establishing the program's budgeting, contracting and management programs with an eye toward increased involvement of the private sector. Finally the model is designed to de-emphasize early commitments to full-scale development and production while establishing and maintaining early communication with Congress regarding agency mission needs and goals. [Ref. 74:pp. 227-228]

b. ***Milestones and Phases***

Following the mission need determination DoD begins the painstaking task of determining the requirements necessary to meet the established need and develop a program structure. A program structure indicates the phases and milestone decision points established for a program. First a general concept of the requirement is established. Then the phases and milestone decision points help to convert the broad mission needs into more specific performance requirements. It is from these specifics that a Statement of Work (SOW) is created for the system and, ultimately, a stable design is conceived. [Ref. 31:pp. 1-2]

The DoD 5000 series instructions provide a general model (illustrated below) with major milestone decision points and phases of the acquisition process. This model provides a basis for comprehensive management and progressive decision making associated with program maturation. All programs must accomplish certain core activities but the Milestone Decision Authority (MDA) can tailor milestones and phases to support the specific acquisition situation. This tailoring process is dependent on the

complexity of the item or acquisition (for example, some activities apply only to Acquisition Category (ACAT) I but not ACAT IA programs). How these activities are conducted is based on a program by program basis through the Integrated Product Team (IPT) process. [Ref. 24:Part 1, p. 3]



[General Acquisition Guidelines, DAD, Version 2.3, Mar 98]

Figure 2: General Acquisition Guidelines

The initial milestone (Milestone 0) is the program's Concept Studies Approval. Following a validation of a program's mission need there is an approval to enter the process of concept study. Approval by the Milestone Decision Authority (MDA) at this milestone does not mean that a new acquisition program has been initiated, but rather that the program can enter Phase 0. [Ref. 24:Part 1, p. 5]

Phase 0 is the Concept Exploration Phase for a program, which usually includes competitive, parallel short-term concept studies. The purpose of these studies is to identify and evaluate the feasible alternative concepts and establish the basic measures to be used in comparing and assessing these concepts. A proposed acquisition strategy should be formulated during this phase. At the conclusion of this phase the program will be at Milestone I. [Ref. 24:Part 1, p. 4]

At Milestone I the MDA must assess the results of Phase 0 and decide whether those results merit the establishment of a new acquisition program. In its assessment the MDA will approve the following essential program elements:

(1) an acquisition strategy;

(2) Cost as an Independent Variable (CAIV) objectives;

(3) an Acquisition Program Baseline (APB) and,

(4) Phase I "exit criteria" program-specific results required in the next phase.

Following the approval of these items the program exists as a legitimate acquisition program and will enter Phase I. [Ref. 24:Part 1,p. 6]

Phase I for a program involves the definition of the program and an endeavor to reduce its various risks. Program Definition entails decisions on which concept(s) to examine, as well as the system design approaches, and/or parallel technologies, to pursue. During this phase the program defines its operational requirements, updates the Operational Requirements Document (ORD), and makes preliminary quantity decisions for Low-Rate Initial Production (LRIP), when applicable. The objective of LRIP is to produce a minimum quantity of items necessary to provide articles for testing, formulate a production base for the program, allow for a orderly increase in production rate, and be sufficient to switch over to full-rate production after sufficient and satisfactory operational testing results occur. Once the exit criteria have been met the program will seek, at Milestone II, MDA approval to enter the Engineering & Manufacturing Development (EMD). [Ref. 24:Part 1, p. 4]

At Milestone II the MDA must assess the results from Phase I and again determine if the program warrants continuation and, if so, whether it is ready to proceed

to engineering and manufacturing development. In addition to the same essential program elements that it approved at Milestone I, the MDA may, as applicable, grant approval for the program to enter into LRIP and approve the proposed LRIP quantities. Following approval of these elements the program may enter Phase II. [Ref. 24:Part 1, p. 6]

Engineering and manufacturing development occur during Phase II. The principle objectives of this phase are as follows:

(1) translate the best design approach into a stable, interoperable, producible, supportable, and cost-effective design;

(2) validate the manufacturing or production process, and

(3) demonstrate the capability of the design through testing.

If anticipated and previously approved, LRIP occurs during the latter half of this phase. These production items are essential in the testing and design refinement phases of the program as it prepares to meet Milestone III. [Ref. 24:Part 1, p. 4]

In the final milestone, Milestone III, the MDA approves the program's intended production or fielding/deployment. The MDA must assess the results from Phase II and specifically approve the program's Acquisition Strategy, APB and Phase III exit criteria before Phase III may begin. [Ref. 24:Part 1, p. 6]

Phase III, the Production, Fielding/Deployment phase, involves the essential task of achieving operational capability of a system that meets the original requirements established from the mission need. During this phase additional testing will take place and continuous assessment of capability occurs. If flaws occur or necessary changes are identified there could be modifications made to the system. Any such

changes/modifications that are considered to be minor and within the original scope of the acquisition are made part of the program being modified. If, however, the modification is of such cost or complexity that the work could, itself, qualify as an ACAT I or ACAT IA program then it will be considered a separate acquisition action. [Ref. 24:Part 1, pp. 4-5]

Operational Support and Demilitarization are the remaining stages of the program acquisition. While they do not represent phases of the program they are indeed essential elements of any program. Operational support contemplates follow-on testing and the transition of material and training support from contractor to Government support if necessary. Demilitarization and Disposal contemplates the issues of what is to be done with the system at the end of its useful life. The Program Manager (PM) and Contracting Officer must adequately plan in advance for this eventuality. [Ref. 24: Part 1, p. 5]

c. *Risk Management and Concerns*

An essential element of any acquisition process is the mitigation of risk. DoD Program Managers traditionally use cost, schedule, and performance parameters to control and measure the success of their programs. Awareness of the primary areas of risk in cost, schedule and performance is becoming more prevalent. Recently, proactive risk management has been a major point of emphasis as evidenced in the latest DoD 5000 Series directives and the Defense Acquisition Deskbook. [Ref. 55:pp. 1-2]

The DoD 5000.2R, Part 3, requires Major Defense Acquisition Program (MDAP) Program Managers to "establish a risk management program for each acquisition program to identify and control performance, cost and schedule risks". [Ref. 24:Part 3, p. 6] The program should identify the risk drivers, define risk reduction

measures and provide continuous risk assessment throughout the acquisition process. Risk reduction measures should be included in cost-performance trade-offs and the program should include back-up plans in high risk areas. [Ref. 24:Part 3, p. 6]

In 1997 the Assistant Secretary of the Navy (Research, Development & Acquisition) surveyed forty-one Navy programs to collect information on the implementation of risk management. This total represented 18% of all active programs and was broken down as 48% ACAT I, 27% ACAT II, 11% ACAT III, and 13% ACAT IV. The results show a significant emphasis on the subject and in their implementation of Risk management measures:

- Approximately half of the programs surveyed did not have Risk Management plans; however, all ACAT I programs (with one exception) had Risk Management plans.
- Although a majority of ACAT II through ACAT IV programs lacked formal Risk Management plans, they included Risk Management criteria in their program management plans. These criteria are applied during periodic assessments.
- Few programs had formal Risk Management training programs, yet most program offices indicated that some type of training would be beneficial.
- All programs with Risk Management plans used defined criteria, rather than subjective assessments, for High, Medium, and Low Risk ratings.
- All ACAT I programs had contractual requirements for a Risk Management program; few ACAT II, III and IV programs had such a requirement.

- Three programs, all ACAT I, used the concept of an independent Risk Assessment team. [Ref. 55:pp. 1-2]

As previously discussed, at each milestone decision point, assessments are made regarding the status of program execution and the plans for the next phase and the remainder of the program. During these assessments the various risks associated with the program and the adequacy of risk management planning are explicitly addressed. Additionally, the exit criteria are established and approved prior to the commencement of each phase. [Ref. 24:Part 3, pp. 2-3]

The systematic review and control of the program from the various levels of the chain of command are inherent risk reduction measures established for all major system acquisitions. Acquisition authorities act to ensure that contracts are structured so that milestone decisions are made well before expenditure of funds on activities in subsequent phases. The objective is to provide fiscal controls without delaying the acquisition decisions or contracts. [Ref. 31:pp. 1-2]

Further risk reduction efforts are made within the particular phases. Phase 0 involves a great deal of market research and the formulation and use of Integrated Product Teams (IPTs) to look objectively for the most capable and practical solutions to the mission need. By opening the acquisition to the various concepts for examination and evaluation, the valued concept of competition is introduced/applied to the process and a measure of cost and performance risk is lessened. CAIV objectives are also identified during Phase I. Their implementation and use are a principal cost-risk mitigation measure for any program. Additional Phase I risk reduction measures include the initial product testing, usually of prototypes, and demonstration. The ability to examine a

prototype in use helps defray the three major risks where the Government can assess, early in the process, the feasibility of use and any major design changes required. The principal risk reduction measure in Phase II is the introduction of LRIP. This process allows both the contractor and the Government to reduce and monitor, in a sequential manner, the production process and the feasibility of the system. Finally, Phase III efforts to reduce risks include operational testing and evaluation. Although late in the acquisition process, these measures are still effective in reducing the risks to the Government in the long run especially where life cycle performance and cost elements are considered.

The risk management measures inherent in the formal acquisition process do present some concerns. The principal concerns are lengthy cycle time and "requirements creep". Cycle time reduction has become a major concern in the military with Secretary of Defense Cohen's challenge to reduce acquisition cycle time by 50% by the year 2000. [Ref. 46:p. 79] This challenge has been issued in part because studies of cycle time reductions have resulted in significant cost and quality improvements. The lengthy nature of the formal acquisition process hinders the ability to capitalize on these savings and improvements. [Ref. 13:p. 176] Also of concern are the cost increases and delivery delays caused by "requirements creep" – a circumstance where system demands increase incrementally as it goes through the acquisition process. Again, the longer the process, the greater the risk of this phenomenon. [Ref. 16:p. 16]

3. Advantages and Disadvantages of the Traditional Acquisition Process

a. *Advantages*

There are many advantages to the methods involved in the traditional acquisition process. The following paragraphs will list and discuss a few of the major advantages.

Acquisition personnel have a great deal of familiarity with the process. This presents a distinct advantage in the experience and comfort that they bring to the process. The various requirements in the process are known to personnel and have, over the course of time, been refined and amended to best serve the Government's interests.

Another advantage is the amount of review and oversight involved in the process. In any acquisition of major cost or complexity there is risk. Oversight and consistent program review can help evaluate and mitigate the risk involved. There are many checks and balances built into the process in the form of MDA reviews, Defense Contract Audit Agency (DCAA) reviews, DoD 5000 Series Milestone and Phase requirements, and public scrutiny. Again, the reduction of risk through extensive oversight helps to serve the Government and thus the public's interests.

A final advantage to address is the ability of Program Managers and acquisition personnel to tailor the process to best accommodate the acquisition. The advent of the Federal Acquisition Reform Act (FARA) and the Federal Acquisition Streamlining Act (FASA) has led to cost and time savings in the traditional acquisition process. Tailoring allows the use of the traditional risk reduction measures while still working within a familiar and refined process.

b. *Disadvantages*

Ironically one of the principal disadvantages to the traditional acquisition process is also one of its advantages: the amount of review and oversight. Due to the amount of cycle time involved in these and other traditional DoD acquisition process measures, the process can become laborious and costly. Commercial acquisition and program management studies have proven that if cycle time can be driven down, cost and quality will improve. [Ref. 13:p. 176] The Secretary of Defense (SecDef) has recognized this potential and recently challenged DoD upper management to cut cycle time by 50% by the year 2000. This initiative will have to overcome many obstacles including the established mindset entrenched in the DoD acquisition community. [Ref. 46:pp. 79-80]

During this period of great global change the extreme length of an acquisition program can create a significant competitive disadvantage. By forgoing short-term solutions for longer-term, major systems solutions, DoD can jeopardize the military capability to combat new more advanced technological forces and threats. [Ref. 63] The average ACAT I acquisition is currently running approximately 110 months to completion. No one can predict with exact accuracy what threats will be most prominent or what world conditions will exist in 10 years and yet we are procuring weapon systems based on that premise. [Ref. 63]

The preceding sections examined major formal acquisition process advantages and disadvantages. These advantages and disadvantages are addressed once again in this chapter as they are used in a comparison of the formal acquisition process and the ACTD acquisition processes.

D. ADVANCED CONCEPT TECHNOLOGY DEMONSTRATIONS

1. Background

> A declining budget, significant changes in threats, and an acceleration in the pace of technology development have created challenges to our ability to adequately respond to rapidly evolving military needs. In addition, the global proliferation of military technologies, resulting in relatively easy access to these technologies by potential adversaries, has further increased the need to rapidly transition new capabilities from the developer to the user. [Ref. 40:p. 1]

The Advanced Concept Technology Demonstration (ACTD) program evolved as a response to recommendations of the Packard Commission of 1986 and the Defense Science Boards of 1987, 1990, and 1991. [Ref. 40:p. 1] The Packard Commission outlined the problem in 1986 by stating that "too many of our weapons systems cost too much, take too long to develop, and – by the time they are fielded – incorporate obsolete technology". In early 1994, the DoD initiated the program and designed it to help expedite the transfer of maturing technology from the developer to the military warfighter and help the DoD acquisition process adapt to today's economic and threat environments. [Ref. 40:p. 1] There are currently 43 active ACTD program ranging in cost estimates from $750,000 to $950 million. [Ref. 63]

a. *Purpose*

The ACTD process was developed to quickly convert new or technologically superior capabilities to the warfighter in the field. The process emphasizes the integration, rather than the development, of technology and the real operational capability of the system as it is actually made part of military deployments. [Ref. 77:p. 13] The warfighter is provided a prototype capability that is to be evaluated

through extensive use in real military exercises and "at a scale size sufficient to fully assess military utility". [Ref. 40:p. 1]

> ACTDs are designed to allow users to gain an understanding of proposed new capabilities for which there is no user experience base. Specifically, they are designed to allow the warfighter an opportunity to
> · develop and refine the associated concept of operations to fully exploit the capability under evaluation,
> · evolve the operational requirements as experience and understanding of the capability are developed,
> · and operate militarily useful quantities of prototype systems in realistic military exercises, and on that basis to make an assessment of the military utility of the proposed capability. [Ref. 40:p. 1]

The ACTD process promotes a solid understanding of the operational utility prior to any full-scale procurement effort by allowing the military end-users the opportunity to provide their input. [Ref. 77:p. 13] Dr. Paul Kaminski, former USD(A&T), summarized the purpose of ACTDs as follows:

> The intent is for ACTDs to marry technology and the related employment doctrine. This marriage, I think, is the one thing that we have not given adequate attention to in the Department in the past. We have traditionally underestimated the importance of developing the appropriate doctrine and the tactics for the employment of technology along with the related training of the people who will use the system. [Ref. 43:p. 2]

b. *ACTD Classes*

Policymakers within the Office of the Secretary of Defense recognized that there are varying degrees of complexity involved with the many systems in ACTDs. To aid in the organization and management of these various systems, DUSD(AT) created and defined three classes of ACTDs. [Ref. 77:p. 15] The three classes were divided on

the basis of the base technology involved and the long-term plan for the system. [Ref. 16:p. 12]

Class I ACTDs were defined by the Deputy Under Secretary of Defense for Advanced Technology {DUSD(AT)} as "software or workstation" items. [Ref. 77:p. 15] This class of ACTD usually consists of information systems with specifically designed software operating through commercial workstations. Generally they are required in small quantities and often the military need can be filled with little or no further development or production required. [Ref. 34:p. A32]

Class II ACTDs were defined by the DUSD(AT) as "stand-alone systems". [Ref. 77:p. 15] The systems associated with this class of ACTD are most closely related to the types of systems typically procured through the formal acquisition process. They are primarily weapon or sensor systems and in many cases "will be planned to transition into LRIP following the ACTD". [Ref. 34:p. A32-A33]

Class III ACTDs were defined by the DUSD(AT) as a "system of systems" [Ref. 77:p. 15]. Class III ACTDs generally involve several "weapons systems integrated within an overarching framework" [Ref. 77:p. 15].

> An individual element within the overall architecture of a Class III ACTD may be a fielded system, a system already in acquisition, or a system emerging from the technology base. The overall ACTD may involve multiple Program Executive Officers, and perhaps multiple Military Departments. The challenge may therefore be to integrate and coordinate the individual transitions to achieve the capability represented in the ACTD. [Ref. 34:pp. A32-A33]

2. Process

a. *Initiation*

(1) Need Identification and Industry Response. At the beginning of each fiscal year ACTD initiation begins with a data call from the DUSD(AT) to the Service Research and Development (R&D) and warfighting communities. Responses are due the following January. The responses from R&D representatives usually propose candidates that reflect capability of mature technology that can be applied to a military requirement. The warfighters respond with a descriptive, prioritized list of needs that may or may not include a proposed solution. When there is no proposed solution, the staff for DUSD(AT) will work with the R&D community to identify possible candidate solutions. However, when the submission is "in the form of a statement of need, a response must be formulated, either as an extension of existing capability or as a new capability". This is important to document because, if the formulation of a concept does not start until formal ACTD submission, there could be significant delay in defining, evaluating and approving the ACTD. [Ref. 33: p. 2]

(2) Submission. The DUSD(AT) is responsible for the collection of submissions, selection and approval of ACTDs. The ideal situation for any candidate for consideration/submission is to have a unified user/developer team that has combined an operational need with a mature technology. The DUSD(AT) staff can then assist in the team development and clarification of the criteria and refinement of the concept. [Ref. 3:p. 2]

(3) Selection. Once an ACTD concept has been fully defined, a briefing of the ACTD is presented to DUSD(AT). At this point the ACTD is either

accepted for further discussion, returned with guidance for refinement, or rejected. [Ref. 3:p. 2] The focus of the evaluation is based on three major areas: response to user needs, maturity of technologies, and potential effectiveness. [Ref. 40:p. 4]

> **User needs**: ACTDs focus on addressing critical military needs. To evaluate proposed solutions to meet these needs, intense user involvement is required. ACTDs place mature technologies in the hands of the user and then conduct realistic and extensive military exercises to provide the user an opportunity to evaluate utility and gain experience with the capability. The process provides the users a basis for evaluating and refining their operational requirements, for developing a corresponding concept of operations, and ultimately for developing a sound understanding of the military utility of the proposed solution before a decision is made to enter into the formal acquisition process. Furthermore, a key objective of ACTDs is to provide a residual operational capability for the warfighter as an interim solution prior to procurement.
>
> **Exploit mature technologies**: ACTDs are based on mature or nearly mature technologies. By limiting consideration to mature technologies, the ACTD avoids the time and risks associated with technology development, concentrating instead on integration and demonstration activities. This approach permits an early user demonstration on a greatly reduced schedule at a reduced cost.
>
> **Potential effectiveness**: The potential or projected effectiveness must be sufficient to warrant consideration of an ACTD or the capability must address a need for which there is no suitable solution. [Ref. 40:p. 4]

Once an ACTD passes this stage, it is briefed to an advisory board consisting of senior acquisition and operational executives made up of representatives from the warfighting, Advanced Research, and Science & Technology communities. This board is known as the Advanced Technology Breakfast Club. [Ref. 63] The Breakfast Club reviews and assesses the ACTD based selection criteria, which are

intended to be guidance for the formulation of ACTD candidates as well as structure for the process of ACTD selection. [Ref. 33: p. 2] The ACTD Selection Criteria as outlined in the Guidelines for ACTD Formulation were established by the DUSD(AT) and are provided in full text in Appendix A. The following is a synopsis of the criteria:

- **The timeframe for completing the evaluation of military utility is typically 2-4 years.** This timeframe provides sufficient time to design and assemble functional prototypes for warfighters to evaluate. The timelines should be kept as short as practical, allowing less time for less complex or readily available systems (e.g. Commercial Off-the-Shelf (COTS) items) or longer for more complex systems. [Ref. 33: p. 2]
- **The technology should be sufficiently mature.** ACTDs should begin with mature or relatively mature technology and should be evaluated with a focus on military utility of the proposed capability. Maturity of the technology ensures the timeframe requirements are more readily met as development of technology can create schedule uncertainty. The assessment of military utility of ACTD items often involves the involvement of large military forces in force-on-force military exercises. To ensure these exercises are conducted according to plan, everything must be available on schedule and must be capable and perform as predicted. [Ref. 33: p. 2]
- **Provides a potentially effective response to a priority military need.** "The need that is being addressed by the proposed candidate must be clearly supported by the intended user of the capability." [Ref. 33:p. 3]

Since the JROC prioritizes the ACTD candidates according to military need, the candidate ACTDs should concentrate on presenting reasonably cost-effective capabilities to meet military needs that will be given priority in that forum. [Ref. 33: p. 3]

- **The User signs up to be intimately involved in the ACTD.** User/warfighter sponsorship involvement is essential to the success of an ACTD. Since it will be the warfighter who conducts the military utility of the system no ACTD can even be initiated without a commitment from a warfighting element to perform that assessment and fully participate in the ACTD. [Ref. 33: p. 3]
- **A lead Service/Agency has been designated.** Without exception, ACTDs will not be approved without a lead Service/Agency that has accepted responsibility for transition preparation at the end of the ACTD. This transition planning is essential and comes under the lead Service/Agency since it will be that entity that will, in almost every case, take responsibility of the capability after the demonstration and make the decision whether to proceed to formal acquisition. [Ref. 33: p. 3]
- **The risks have been identified, are understood and accepted.** Risks will be involved in any ACTD, especially technical risks inherent in engineering and system integration. Other risks to be identified and assessed are programmatic risks (e.g. cost and schedule), and operational risks. [Ref. 33: p. 3]

- **Demonstrations or exercises have been identified that will provide an adequate basis for the utility assessment.** The principal element of an ACTD is the warfighter's military utility assessment. A more broad assessment than normal operational testing, "military utility is defined as: (a) effectiveness in performing the mission, (b) suitability for use by the user, and (c) the overall impact the proposed capability has on the conflict or military operations". [Ref. 33: p. 4] To be effective, the conditions of the assessment must be as realistic as possible, stressing both the equipment, and its operation. The candidate ACTD should propose new exercises/demonstrations or identify current exercises/demonstrations to meet the assessment requirements. [Ref. 33: p. 4]
- **Funding is sufficient to complete the planned assessment of utility and to provide technical support for the first two years of fielding of the interim capability.** The budget submitted as part of the proposed ACTD must identify (1) all design and development costs of the prototype system, (2) any additional units required, (3) all exercises that are to be paid by the project, and (4) all test support costs required to support the military utility assessment. The budget must also include transition planning costs and technical support cost for the first two years of fielding the residuals. The participating technology programs primarily fund ACTDs with supplemental funding (typically about 10% of the total cost of the ACTD) from the DUSD/AT funding line, as appropriate. [Ref. 33: p. 4]

- **Developer is ready to prepare a plan that covers all essential aspects.** An ACTD Management Plan presented to the DUSD(AT) for final signature within 90 days following approval of an ACTD. This Management Plan should be coordinated and approved by all principal participants early in the ACTD process. [Ref. 33: pp. 4-5]

These criteria are not exhaustive. The Advanced Technology Breakfast Club will consider other factors to better ascertain the ACTD's ability to meet the objectives of the program. Other major factors that should be considered include affordability, interoperability, sustainability, and evolutionary capability. Affordability centers on the total ownership cost (TOC) perspective. Interoperability is an important consideration, especially when the item is a new capability that is be used on the future battlefield. Sustainability is an essential element for consideration since items involved in ACTDs will remain in the field. Finally, the concept of evolutionary capability should be considered. This concept centers on the idea that the item will provide an initial capability that can be utilized and developed and modified as technology or threats evolve. [Ref. 33: p. 5]

Once the Advanced Technology Breakfast Club (AT/BC) has evaluated an ACTD candidate it will be presented to the Joint Staff, through the appropriate Joint Warfare Capabilities Assessment (JWCA). This tribunal will use the ACTD Selection Criteria and additional factors in its review, assessment and comment. [Ref. 3:p. 2] The DUSD(AT) will consider the recommendations and comments of the AT/BC and Joint Staff and determine whether to retain the ACTD candidate and forward it for presentation to the Joint Requirements Oversight Council (JROC). The JROC will

review all candidates received and prioritize them based on their relative ranking in terms of military need. Following the JROC prioritization, the information on the remaining candidates is forwarded to the Congressional Authorization and Appropriations Committee for their committee marks. [Ref. 33: p. 7]

> A final review, termed the "Final Scrub", is then conducted just prior to the start of the fiscal year of those candidates ranked by the Joint Staff and OSD as most deserving of ACTD status. The focus of this review is once again on the election criteria, with the addition of two other topics; transition strategy and proposed ACTD management structure. Once all final reviews of the viable candidate have been completed, a final ACTD selection list is established by the DUSD(AT). This ACTD list is then coordinated with the Vice Chairman, JCS and the Under Secretary of Defense (Acquisition and Technology) before the final ACTD Implementation Directives for the approved ACTDs are signed by the DUSD(AT). [Ref. 33: p. 7]

The following figure is a flowchart that diagrams the entire ACTD formulation and approval process including selection and funding. [Ref. 3:p. 2]

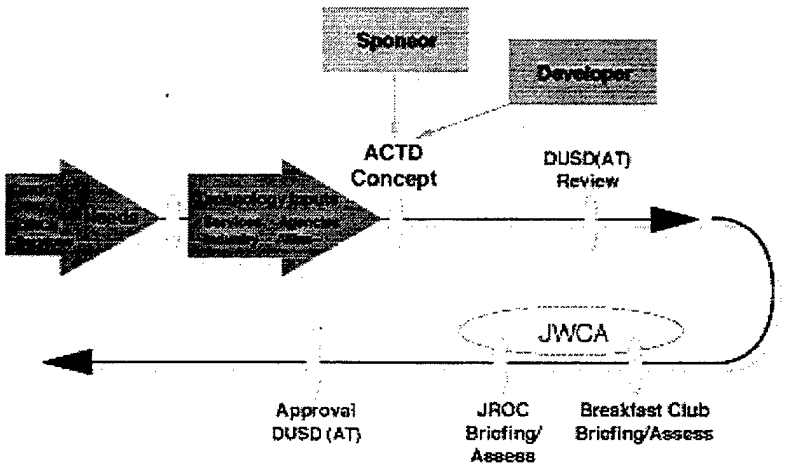


Figure 3: ACTD Formulation and Approval Process

Figure 3 Acronyms:

ACTD -	Advanced Concept Technology Demonstration
JROC -	Joint Requirements Oversight Council
JWCA -	Joint Warfare Capabilities Assessment
CINCs -	Commanders in Chief
DUSD(AT) -	Deputy Under Secretary of Defense for Advanced Technology

b. ***Management***

(1) Staffing. "Each ACTD is managed by a Lead Service or Agency developer and driven by the principal User-Sponsor" [Ref. 40:p. 5]. As a result of the lessons learned from the Medium Altitude Endurance Unmanned Aerial Vehicle (UAV), "Predator" ACTD, the Lead Service is now required to be named prior to the approval of an ACTD. [Ref. 63] The Lead Service must define the operational requirements of the ACTD prior to any acquisition decision [Ref. 29] and is "a significant contributor of funding" [Ref. 52]. The User-Sponsor is almost always a command and is usually a Unified Commander. This User-Sponsor provides to the ACTD the warfighter's perspective. The JROC will make recommendations to DUSD(AT) regarding the Lead Service designate as part of their review and comments on ACTDs. Since all user and developer organizations are represented on the oversight groups chaired by DUSD(AT) they are capable of quickly and properly deciding on issues critical to the direction and organization of candidate ACTDs. [Ref. 40:p. 5]

The other major staffing involves the members and structure of the ACTD Management Team. Per ACTD policy, each ACTD must have an Operational Manager (OM), designated by the User-Sponsor, and a Technical Manager (TM), designated by the Lead Service. [Ref. 63] The joint managers are tasked to use Integrated Product Teams (IPTs) to manage the process and be "expediters to accomplish traditional tasks, to some level of completion, on a non-traditional timeline". [Ref. 47:p.

15] The Technical Manager, formally known as a Demonstration Manager, is also to serve as a Co-Chair, with the DUSD (AT), of the Development/LRIP Transition IPT. [Ref. 63]

(2) Management Plan. The last step in the ACTD initiation phase is the completion, presentation and approval of the ACTD Management Plan. This plan is a major element for the overall management of the ACTD. The Management Plan should provide a baseline program definition, as well as conditions under which operational use and technical concepts can be refined and traded off before, and in preparation for, entering the formal acquisition process. [Ref. 34:p. 15]

> The ACTD Management Plan provides for each ACTD a top-level description of the demonstration with sufficient detail that the vital objectives, approach, critical events, participants, schedule, funding, and transition objectives are understood and (by endorsement) agreed upon by all relevant parties. Measures of evaluation, to be considered in addressing both effectiveness and suitability of the capability being evaluated, should be clearly defined. [Ref. 34:p. 15]

The Management Plan should be modified throughout the ACTD process but only significant modifications, such as significant budget and schedule changes, would require approval by the ACTD's Oversight Group. [Ref. 34:p. 15]

(3) Budgeting. The principal issue in ACTD budgeting process is to determine the amount and timing of funds available for the ACTD and any follow-on acquisitions. The majority of funding for any ACTD is through the Lead Service and is funded within the appropriate President's Budget. There are additional funds provided by DUSD (AT) for ACTD integration expenses and residual capability technical support. [Ref. 7] Cost As an Independent Variable will be implemented in the

development contract. Funding is to be reviewed annually by the joint managers who will submit reports and recommendations to the Oversight Panel for review and concurrence. [Ref. 34:p. A22]

> Funding for the complete ACTD must be identified and committed for all fiscal years included. However, unlike the case for a formal acquisition phase decision, out-year funding beyond the ACTD demonstration phase and its two-year follow-on phase need not be committed. The funding from each participating party will be listed for the FYDP and POM cycles, with detail down to the Program Element (PE) and Project level. Advanced planning may be required to ensure adequate funding for an ACTD is provided in the Presidents Budget submission. The funding baseline should include all funds required for completion of the ACTD and, separately identified, the funding of supporting S&T efforts which are essential to the ACTD. The purpose of the latter is to identify the funding required to assure successful completion of the demonstration. Once this baseline Plan has been agreed to by all participating parties, changes to the funding plan, including the supporting S&T portion, will be made only with the understanding and concurrence of the Oversight Group. [Ref. 34:p. A22]

Following the ACTD, the ACTD residual item(s) will remain in the field and a decision will be made as to whether to continue procurement of additional item(s). If the program successfully transitions to formal acquisition then there may be a requirement for additional funding. [Ref. 63]

(4) Transition. For an ACTD which demonstrates strong military utility and for which there is additional operational requirement, the intent is to transition the procurement into the formal acquisition process. [Ref. 61:p. 1] "The objective is to transition into the acquisition phase without a loss of momentum" [Ref. 29]. This transition must be properly planned to avoid a costly, and ACTD process-

defeating, delay that could occur from an occurrence such as a break in the production lines. [Ref. 61p. 1]

"Transition Planning includes both transition of residuals, and transition to acquisition" [Ref. 29]. While transition occurs at the end of the ACTD, its goals are established at the beginning and are overseen by a Transition Integration Product Team (TIPT). [Ref. 29] "The key to a successful transition is getting the acquisition community and the user community working together early through an integrated product team (IPT)" [Ref. 57:p. 33]

> The TIPT is co-chaired by a representative from ODUSD/AT and the ACTD Technical Manger. (Lead Service representation is required, especially if the ACTD is going to transition to a Service-managed program.) The TIPT includes representation from all of the stakeholders in the ACTD to include the User-Sponsor, the Lead Service, the developer(s), the supportability community, the Joint Staff, Office of Department of Operational Testing and Evaluation (ODOT&E), and the operational test agencies, as well as the OSD and service staff elements that will be involved in the formal milestone review that occurs at the end of the ACTD. [Ref. 61:p. 9]

The principal areas for planning that must be addressed by the TIPT are: Operational Requirements Document (ORD) preparation; Interoperability issues; Affordability; Documentation requirements; Funding; Contracting issues; Utility Assessment during Test &Evaluation; and Supportability. [Ref. 29] Figure 4 depicts the overall framework for ACTD Transition Planning and illustrates the strong role it plays in the formulation phase, the key issues considered by TIPTs, and the major reviews held near the end of the ACTD process. [Ref. 61:pp. 9-10]

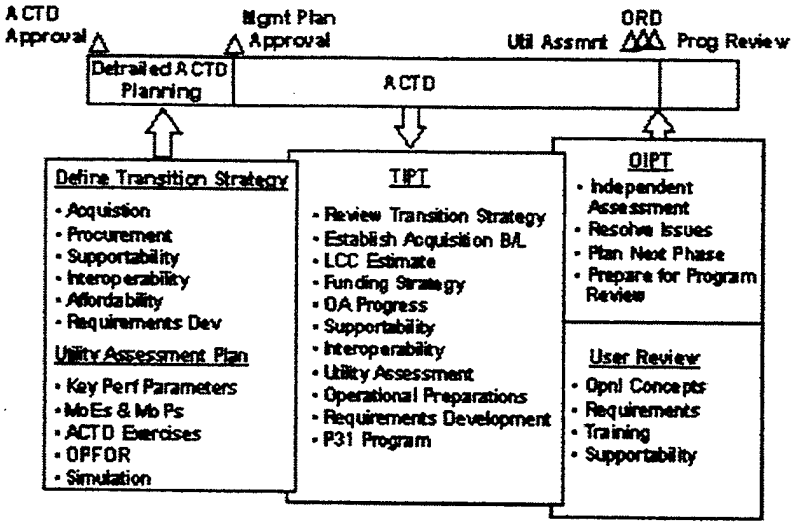


Figure 4: Framework for ACTD Transition Planning

c. *Risk Management and Concerns*

As discussed previously, an essential element of any acquisition process is the mitigation of risk. [Ref. 55:pp. 1-2] The governing principle behind ACTDs is the ability to, in essence, "fly before you buy". The nature of any demonstration program is to reduce the risks in the acquisition process. The buyers in these programs are more informed and more likely to ensure that operational requirements are met by those items chosen for procurement beyond the demonstration phase. [Ref. 26: p. 1]

Another risk mitigation method that is employed in ACTDs is the use, rather than the development, of relatively mature technology. The technical risk is managed and minimized since the higher risks are not in the "core system" [Ref. 52]. ACTDs intend to demonstrate mature or emerging technologies within two to four years. This also limits the amount of funds at risk as ACTD funds are to be used to seek use for, or integrate technologies already in existence. [Ref. 26: p. 2]

The operational risks are also reduced in ACTDs. The former USD(A&T), Dr. Kaminski, acknowledged that, in using newly developed technology, the technical risk is low, not knowing how to utilize that technology can produce high operational risks. That is why, Kaminski says, "the emphasis in an ACTD is on the operational concept, not the technology". [Ref. 42:p. 1]

> In many cases, the technology may turn out to be operationally useful. The demonstration approach is still attractive because, for a modest investment, we would know what the shortcomings are and have a chance to try again. Even in situations where the applications look very promising, getting prototypes into the hands of the user early in the acquisition process gives us an opportunity to factor important operational considerations into subsequent acquisition decisions. [Ref. 42:p. 1]

Risk reduction methods employed by the formal acquisition process are also present in ACTD programs. Should the ACTD transition occur the program would enter a formal acquisition phase, thus adopting the risk mitigation methods normally expected in the formal acquisition process including LRIP. As it is with the formal acquisition process, CAIV initiatives are also made part of the ACTD acquisition process. "Their implementation and use are a principal cost-risk mitigation measure for any program." [Ref. 33:p. A19] Similar to the formal process reviews at each milestone there are periodic risk assessments made regarding each ACTD by the ACTD Oversight Group headed by the DUSD(AT). [Ref. 33: p. A1]

A final risk reduction method involved in ACTDs is employed by a jointly sponsored Information Warfare Red Team. This team was established by the DUSD(AT), the Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence (OASD)(C3I) and the Joint Staff (J-3) with a goal of

improving the readiness posture of the DoD. "This improvement is accomplished by identifying vulnerabilities in information systems and vulnerabilities caused by use of these information systems, then demonstrating these vulnerabilities to operators and developers." While this type of risk is applicable only to ACTDs that involve information systems, it does help to eliminate operational risks involved in the applicable ACTDs. [Ref. 39:p. 1]

Some risks in ACTDs will remain however, as there can be technical risks associated with engineering and integration work to be performed.

> The more complex the capability, the greater these risks tend to be. In addition, there can be programmatic risks (e.g. cost and schedule), as well as operational risks related to the acceptability of the operational concepts necessary to realize the full benefit of the proposed capability. These risks must be identified and accepted by the primary stakeholders in the ACTD prior to its initiation. [Ref. 33: p. A7]

Critics find some risk elements of the ACTD process to be problematic. One concern is that legitimate oversight is circumvented in allowing the ACTD programs to rapidly develop systems for use by the warfighter. The risk of overspending is heightened without this oversight. Another concern is proper attention is not being paid to the life cycle costs of building, supporting, and operating the systems beyond the initial phase of demonstration. [Ref. 16:p. 1]

A final major concern is that the ACTD program has allowed questionable selections to proceed. The principal criticisms are that the criteria for selection are not well defined and are not being properly applied. The ambiguity of the criteria, especially that of "mature technology", has resulted in developers and future users selecting projects which represent a wide range of maturity levels (i.e. Low Life Cycle Cost - Medium Lift

Helicopter ACTD). This has created a burdensome array of performance evaluation and funding decision criteria. [Ref. 16:pp. 16-17] Some projects are viewed as not mature enough. The criticism in these questionably selected programs is that the managers may not be afforded the framework within which to manage risks as well as they would in the formal process. Concerns exist that this could lead to increases in costs in the long run. [Ref. 16:pp. 18-19]

> Despite the AT Office's attempts to address the issue of technological maturity, the subject remains problematic. Some defense officials argue that developing an explicit definition of it is virtually impossible; ACTDs simply incorporate too wide a range of technologies. Proponents also suggest that since the Breakfast Club is composed of officials who are well seasoned in defense acquisition, it possesses enough expertise to assess the technical maturity of candidate projects. [Ref. 16:p. 21]

3. Comparison of ACTDs to the Traditional Acquisition Process

Any comparison of the ACTD process to that of the traditional formal acquisition process must be prefaced with the acknowledgement that, as stated before, the ACTD program is not a substitute for the traditional procurement process. "The existing process will still be needed for major equipment items such as ships and aircraft." [Ref. 26:p. 2]

The ACTD process is designed to be a pre-acquisition activity that allows the user to operate and assess the military utility of a prototype before a decision to acquire takes place. [Ref. 66:p. 1] This is done in ACTDs with less money committed up-front than in traditional procurements. [Ref. 63] The procurement of additional units or capability beyond the ACTD residuals, where appropriate, will still be accomplished through the formal acquisition process. [Ref. 62] The demonstration of military utility and technical capability in advance of the acquisition decision assists ACTD program managers in

determining which is the appropriate phase to enter in transitioning the ACTD to the formal acquisition process. The ACTD program can enter the formal acquisition process as far downstream as Milestone III, as opposed to the traditional entry point of Milestone 0. [Ref. 3:p. 1] In this way the ACTD can be used to jump-start the traditional acquisition process. If the user decides that the capability has significant utility, an ACTD may initiate a rapid movement into production within that process. "It can also provide insights into the development of doctrine and training, or merely lead to new ideas." [Ref. 26:p. 2]

Differences can be seen between traditional and ACTD acquisition processes in the institution and implementation of acquisition reform measures. The ACTD programs and process are viewed as fundamental core elements in improving our acquisition system. [Ref. 43:p. 1] The differences can be seen in the reduction of cycle time, the use of teaming arrangements and performance specifications, and the structure of the procurement.

Cycle time reduction methodology is a primary difference that can be established as the ACTD can result in a shorter acquisition cycle. [Ref. 26:p. 2] The ACTD process is designed with near term responses to military needs as a primary tenet. This tenet focuses on acceleration of the evaluation process that reduces cycle time compared to the formal acquisition process. [Ref. 33:p. 1]

> The medium altitude endurance unmanned aerial vehicle ACTD enabled the development of Predator from an operational concept to an operational system in only 30 months. This brand of advanced technology enables the acquisition process to begin at Milestone II rather than Milestone zero. [Ref. 26:p. 2]

Teaming between the user and developer and establishment of the IPPD process are mandated elements of ACTDs while existing as recommended elements of the traditional acquisition process. [Ref. 33:p. 1]

> ACTDs are taking full advantage of the integrated product and process development approach that I described a few weeks ago – currently used in the Department – and also used by commercial industry to ensure shorter cycle times, lower cost, and more rapid delivery to the customer. [Ref. 43:p. 1]

The use of performance specifications assessed by military utility is the basic premise of ACTDs, which characterize system performance not requirements. "You can write requirements into the plan but do so at the risk of approaching traditional acquisition process." [Ref. 52] ACTDs, like the traditional acquisition process, involve some testing of the equipment but the end user military utility assessment is the defining test, not an Operation Test and Assessment (OT&A). [Ref. 63]

The structure of the ACTD acquisition process involved considerable management oversight but each ACTD program is highly tailored and generally involves less formal structure than traditional acquisitions. This is due, in part, to the fact that formal acquisitions typically involve programs with higher funding levels and are "governed by laws and regulations which have to be addressed by major defense system acquisition programs". [Ref. 61:p. 1]

> Considering the various mechanisms and approaches used by the Government-industry team to manage and control the Predator ACTD, we need to emphasize that an ACTD is not a major acquisition program, as are, for example, the F-22, F/A-18E/F, and RAH-66A. Rather, it is more similar to a research and development effort for demonstrating a capability to operational users. [Ref. 77:pp. 30-31]

The difference in acquisition process structure is also reflected in the recording and reporting requirements involved in the ACTD process.

> An example that highlights the stark difference between the two processes is that the Predator ACTD utilized minimal supportability documentation, whereas a typical formal acquisition program tends to require a significant amount of supportability data and reference documents. [Ref. 77:p. 31]

Another difference that can be found in comparing the ACTD and traditional acquisition processes is found in the development of the ORD. While both allow for the continuous development of the ORD the ACTD process does not concentrate on a highly intensive up-front effort as seen in traditional acquisitions. The concentration for an ACTD lies in the development of an ORD throughout the process that "reflects the capability of the prototype". [Ref. 29] The ACTD process is designed to provide capability now, via the prototype, while planning for future changes and improvements with the advent of technology development. The development of the ORD is geared to reflect that design. [Ref. 63]

A final difference in the comparison involves the formal planning for supportability of the acquisition. Residuals of ACTDs include the provision for support for a period of only two years. Further supportability issues are addressed in the event of transition. [Ref. 35:p. A35]

> Formal acquisition programs are required to determine supportability plans, conduct logistics support analysis (LSA) tasks, and perform life-cycle cost estimates; ACTD programs are not. This was evident in the Predator ACTD as well. The fast pace and relatively short schedule of the ACTD process made it difficult to adequately determine long-term logistics requirements. Similarly, the primary focus of the ACTD was on the demonstration of technology-and the technical performance of the system-

> and not on how supportable or maintainable the system was. The determination of Predator's military utility by USACOM had virtually nothing to do with logistics or LCC issues. [Ref. 77:p. 45]

E. CHAPTER II SUMMARY

Chapter II of this study provides an introduction to the traditional formal acquisition process and its relative advantages and disadvantages. The formal acquisition process begins with an evaluation of needs in the context of a Service or Agency's mission, available resources and current priorities. The process that follows is a series of Milestones and Phases that are established to provide oversight, evaluation, and development of the initial need as the program matures. The end process of the development is an established set of performance requirements. The final stages in the process involve the use of those established requirements in the physical development (to include Low Rate Initial Production as applicable), production, support and disposal of the item.

Key advantages of the traditional acquisition process are discussed. These advantages include familiarity with the process, established review, oversight and control measures, and the ability to tailor the process to best accommodate the acquisition. Disadvantages of the traditional process are also discussed. The disadvantages include the oversight and review process burden and the risks and cost associated with the length of the formal acquisition.

This chapter also introduces the Advanced Concept Technology Demonstration program and its background, process and procedures. ACTDs are described as a joint effort between the acquisition and warfighting communities intended to exploit mature technologies to rapidly meet military needs.

The selection and demonstration process are discussed and compared to the formal acquisition process. The management structure and process of the typical ACTD are discussed including the staffing and formal ACTD Management Plan. Also discussed are the budgeting and transition planning that must be established for each ACTD. If the military utility of the capability or system is established and there is a further requirement, the ACTD processes will transition into a formal acquisition process. The transition will occur as far downstream in the traditional acquisition process as warranted by military need, program maturity, and projected risk. Additional differences between the formal and ACTD processes were delineated including differences in the implementation of acquisition reform measures, development of the ORD, and techniques to ensure supportability of the acquisition.

Chapter III includes a further discussion of the elements of the ACTD process as described in this chapter and expresses, in more detail, some of the major issues which have arisen in the ACTD process to date. The possible ACTD outcomes, testing issues and challenges associated with the transition to formal acquisition are examined in light of problems that they might create in the ACTD contracting process.

III. EXAMINATION OF ACTD OUTCOMES AND TRANSITION ISSUES

A. POSSIBLE OUTCOMES

Prior to transition and at the conclusion of the ACTD demonstration phase, a decision must be made, relying heavily upon the user's recommendation, on how to proceed with the program. The possible outcomes each involve a decision of whether or not to transition to production and reflect the result of the determination of military utility, the criticality of the need for the capability, the number of systems required. [Ref. 61:p. 3]

1. Transition to Formal Acquisition

a. *Produce Prototype*

When the prototype item or system has been evaluated as militarily effective and suitable for use, "the preferred course of action is to proceed directly into production, probably beginning with LRIP". [Ref. 66:p. 21] Minor modifications could be incorporated in the process provided the risks associated are insignificant. [Ref. 66:p. 21] This outcome results in the opportunity to enter the formal acquisition process somewhere closer to Milestone II instead of a Milestone 0 start. [Ref. 43:p. 8]

b. *Produce Prototype Using Pre-Planned Product Development Improvement*

The second outcome is most prevalent where the warfighting end-user has determined that the prototype item or system is useful but requires specific upgrades to improve the military utility. In these cases the program will proceed directly to production with the basic configuration of the prototype (with minor modifications if

necessary). Upgrading of the system will be accomplished using pre-planned product improvements (P^3I). [Ref. 66:p. 21]

c. *Additional Development Prior to Production*

A third outcome can result when the capability of the prototype item or system does not provide suitable military utility, as is, but could prove militarily suitable with additional development. In this case there would be fairly significant modification expected to make the item or system's capability effective or suitable. Under these circumstances the program would most likely enter the formal acquisition process in the EMD phase (Phase II). [Ref. 66:p. 21]

2. No Transition to Formal Acquisition

a. *Need Satisfaction*

In many cases there could be a determination that the concept is not suitable for production. This determination may be made, not because the item or system was a failure, but because there is no need for any additional items other than the residual items. Another determination may be that the concept is not yet ready for large-scale development but is satisfactory for current use and end-user experimentation. [Ref. 61:p. 3]

b. *Termination*

A final outcome that may result after the demonstration phase of an ACTD is to merely terminate the program. In these cases the capability is not found to have military utility or sufficient potential to justify transitioning the program to formal acquisition. [Ref. 66: p. 21] This does not mean, however, that the ACTD would be considered a failure. In the case of the Kinetic Energy Boost-Phase Intercept ACTD, the

program was assessed as not operationally feasible. The assessment "cost $40 million, but prevented the development of a prototype which would have cost $400 million". [Ref. 26:p. 2]

B. TRANSITION ISSUES

At the conclusion of the demonstration phase the capability is assessed for its military utility. The goal of all ACTDs is to demonstrate strong military utility and subsequently transition into the formal acquisition process to begin the procurement in sufficient quantity to meet the operational requirement. [Ref. 61:p. 1]

This transition is not accomplished without proper planning. There are several issues that confront the ACTD program in the transition process.

> The primary challenges that are faced in preparing for the transition of a ACTD into LRIP are: a) Contracting strategy-motivating the contractor(s) to provide a best value solution and transitioning into LRIP without loss of momentum; b) Interoperability-ensuring that the ACTD can interface with other systems on the battlefield; c) Supportability-ensuring that the fielded systems will be supportable. d) Test and Evaluation-early and continuous participation of the operational testing community and evaluators throughout the ACTD process from definition of data needs and associated military exercises to completion of the Operational Assessment to support the production/transition decision; e) Affordability-assessing affordability and application of a Cost as an Independent Variable (CAIV) strategy; f) Funding-choosing the proper strategy for obtaining the resources necessary for acquisition; g) Requirements-evolving from a mission need and associated performance goals at the start of the ACTD to a formal ORD and/or a system performance specification at the conclusion of the ACTD which captures the technology maturity and the knowledge and understanding gained by the warfighter while using the capability in realistic military exercises; and h) Acquisition Program Documentation-defining and planning for the documentation required prior to the acquisition decision that occurs at the end of the ACTD. [Ref. 61:p. 1]

These issues and the difficulties they pose in the transition to formal acquisition are discussed in the following sections and include some significant lessons learned from past and current ACTD programs.

1. Testing And Trial Issues

To arrive at the previously discussed outcomes, the ACTD program must reach an acquisition decision following an exhaustive assessment of military utility by the warfighting element of the ACTD team. The military utility is assessed after critical examination and evaluation of many factors including suitability, effectiveness, interoperability with other systems, and supportability. [Ref. 54] Major elements of the ACTD program including the major military utility assessment and testing issues impacting the contracting process are discussed below.

a. *Determining Military Utility*

> The basic form of an ACTD generally starts from a collection of mature technologies or technology demonstration programs which are maturing key technologies. The technologies are combined and integrated into a complete military capability. The objective is to provide decision-makers an opportunity to fully understand the operational potential offered by a proposed new military capability before making an acquisition decision. [Ref. 33:p. 1]

As discussed in Chapter I, the User-Sponsor provides the warfighter perspective and has the responsibility of assessing the capability of the ACTD product and determining its military utility. Tom Perdue, the Principal Assistant – Deputy Under Secretary of Defense (Advanced Technology), stated that assessing military utility requires the following:

- Equipping a minimal operational unit to assess unit performance, intra-unit implications, and the effects on other elements of the force,
- Developing the Concept of Operation (CONOP) of the demonstration (This is the scenario and conditions under which the demonstration will be conducted),
- Evaluating under realistic and meaningful operational conditions,
- Collecting data on previously defined critical Measures of Performance (MOPs),
- Collecting input from the operators, and
- Analyzing the results and addressing the military utility elements. [Ref. 63:Slide 16]

In a military utility assessment there are three principal elements which must be examined. The first element questions whether the system has the capability to do what it is supposed to do. The second element examines whether the capability is suitable for use by the operators for which it is intended. And in the third element is an assessment of the item or system's relative importance in the overall warfighting capability. [Ref. 66:p. 20]

The warfighter can better address the first two elements by including the Test and Evaluation (T&E) community. The involvement of both Development Testing and Operational Testing personnel can assist ACTD management establish a set of measures of effectiveness, suitability, performance, and critical operational to assess military utility. [Ref. 61:p. 16] Operational Test Agencies (OTAs) can provide expertise in the planning and assessment of military utility [Ref. 66:p. 21]

The requirements described by Perdue are prevalent in the analysis of the first two military utility elements. To analyze whether the system does what it is supposed to do, the user, in conjunction with other stakeholders, must determine just what the system should do. Developing the CONOP and assembling an operational unit is essential in this analysis. As stated by Michael J. O'Conner, Deputy Director or Technology (Missiles, Aviation, Precision Strike) Office of the Deputy Assistant Secretary of the Army for Research, Development and Acquisition, an ACTD "is as much about doctrinal issues and CONOPs as it is about technology." [Ref. 57:p. 32] The suitability of the system for the forces that will use it can only be accomplished through an extensive planning and analysis of its operation under realistic and relevant operational conditions. [Ref.63]

The assessment of a system's importance in overall warfighting capability is the critical element of determining military utility. This element is vital to subsequent funding and acquisition decisions, but does not necessarily require input and participation from the T&E community. [Ref. 61:p. 16] This element is first assessed in the beginning of the ACTD process as a key element in the ACTD candidate selection process. One of the ACTD Selection Criteria is a requirement that the candidate capability provide "a potentially effective response to a priority military need". [Ref. 33:p. 3] The determination of need is revisited at various points throughout the ACTD process as it is in the formal acquisition process. The design of the ACTD process also allows the capability to evolve and adapt to changes in threat or technology while assessing the need and alternatives throughout the process. [Ref. 33:p. 3]

Need establishment is also very important in the acquisition decision occurring prior to transition. Initial funding for ACTDs is established only through demonstration and two years of residual support. Need establishment thus becomes a necessity for the program to obtain additional funding and transition to full production and procurement. Before any final contracting action can occur for follow-on procurement, the user must show that the system demonstrated "provides a significant contribution to our total warfighting capability". [Ref. 66:p. 21]

b. ***Testing Plan and Results***

> The test and evaluation (T&E) activities within an ACTD provide critical inputs to three separate products that are developed during the ACTD: a) the assessment of military utility performed by the user; b) the operational requirements developed by the lead service; and c) the Operational Assessment prepared by the Operational Test Agency (OTA). [Ref. 61:p. 15]

As previously discussed, the issue of how well the capability responds to the stated military need is best addressed with the input from the T&E community. This input should begin in the planning stages of the ACTD. The ACTD Operations Manager should involve OTA personnel and utilize their expertise to establish a set of military utility measures. This expertise can best be utilized in the structuring of the exercise, defining the data required for analysis, and helping to characterize performance of the system. [Ref. 61:p. 16]

Characterizing the performance entails testing plans the user can employ. These plans are used to compile a quantitative performance description and suitability measurement for the ACTD configuration. These data create a baseline from which the user can assess individual changes in operational requirements in terms of utility, cost,

schedule, and risk. The user can also develop an ORD that incorporates a full understanding and analysis of the tradeoffs involved. [Ref. 61:p. 16] Part of the information required in creating the ORD is the same data compiled to make the military utility assessment and acquisition decision (Acquisition Program Documentation). Keeping the documentation to a minimum is key to keep the ACTD on a fast track acquisition path. This requires close coordination between the developers, the user and the OTA community. [Ref. 61:p. 20]

To reach an acquisition decision there must also be an operational assessment. Using the characterization of performance described above, the operational testers develop the assessment at the same time the requirements are being developed and analyzed by the user. This simultaneous development allows the user to see the time, cost and acquisition schedule implications of any increase in requirements as they are being developed. [Ref. 61:p. 16]

> This gives a complete picture of cost, schedule, and risk implications associated with such requirements and allows the user to make an informed choice between acquiring a capability quickly that is close to the ACTD performance level, or requiring a higher performance level and incurring the increased cost, schedule and/or risk. Once the user completes these tradeoffs and prepares the Operational Requirements Document, the operational tester can issue the operational assessment against those requirements. This assessment will be provided to the acquisition decision maker as a formal part of the transition process. [Ref. 61:p. 16]

OTAs can help evaluate the schedule risks imposed by operational requirement changes. As excursions are contemplated by the end-user the impact of those excursions can be addressed by OTAs for the risk incurred in actually entering the previously intended entry point for formal acquisition. [Ref. 61:p. 20]

The T&E community can assist in other ways as well. While their principal role is to get the most realistic environment to the warfighting evaluators, their support can go beyond that scope. The support of the OTAs can reach into the follow-on acquisition. They can assist in the tracking and use of the experimental data as well as leverage and monitor contractor testing and evaluation. OTAs can also leverage technology to reduce test costs. [Ref. 20]

c. *Testing And Trial Issues Lessons Learned*

There have been many lessons learned from ACTDs regarding military utility assessment and testing and evaluation. Some of these lessons have already been put to use in more recent ACTD programs. For example, lessons learned from the Predator ACTD pointed out the need for a Lead Service to be designated at the start of the process to ensure the military utility planning can be conducted properly. [Ref. 77:p. 57] This recommendation has been incorporated in the ACTD Guidelines. [Ref. 33:p. 3] However, many issues from lessons learned have not been overcome and remain a problem in the process. The following are some of the major lessons learned, and suggestions where applicable, from various ACTD programs:

Lesson: The customer, or user, will change priorities, is busy and in most cases, due to the joint force emphasis of ACTDs, have many components that must be coordinated.

Suggestion: This lesson learned was generated by the Synthetic Theater of War (STOW) ACTD and the solution suggested was to make a concentrated effort to include the customers from the outset of the ACTD. The customer(s) should be involved

in the establishment of the evaluation plan to help establish the schedule and definition of utility. [Ref. 23:Slide 7]

Lesson: The more customers you have the more problems you incur.

Suggestion: Again the involvement of the customer was stressed with a further admonishment to strongly encourage gathering all stakeholders and coordinating efforts and agreements early in the ACTD process. [Ref. 61:Slide 7]

Lesson: Determine and set a definite scope for the ACTD to ensure the mission can be accomplished.

Suggestion: Do not allow any last minute, unplanned tests and establish a firm "good idea cut-off date". [Ref. 23:Slide 7]

Lesson: Require software deliverables and testing on a regularly scheduled basis.

Suggestion: The contractor will be resistant but the ACTD managers must be forceful and ensure this happens to help manage conflicts that will occur among development, integration and testing of the software. [Ref. 23:Slide 8]

Lesson: Exercise or testing dates should be compatible with development to avoid delays.

Suggestion: Use event driven instead of calendar driven schedules as much as possible. [Ref. 25]

Lesson: In developing a CONOP, capture how the warfighter will use the system.

Suggestion: New tools mean new processes. This requires creative thinking and not just automation of old processes. [Ref. 25]

Lesson: Measures of Effectiveness and Performance (MOEs and MOPs) should be made as meaningful as possible.

Suggestion: Use a healthy mixture of the Technical measurements (e.g. Lab results), Objective measurements (e.g. Battle lab results), and Subjective measurements (e.g. Warfighter's assessment of how well the system does what it is supposed to do). [Ref. 25:Slide 6]

Lesson: Success-oriented development schedules do not work.

Suggestion: Especially in the case of software development, plan for time to code, integrate and fix. Slips will happen so plan to use a "Crawl, Walk, Run approach". [Ref. 25:Slide 8]

Lesson: Analysis and Assessment Teams should display a unity of effort.

Suggestion: The ACTD should have a single analysis team, not two or more. [Ref. 54:Slide 8]

Lesson: The methodology for assessing the military utility should be well established.

Suggestion: The National Defense Research Institute study of the Predator ACTD revealed that there were no clear directives on the process to follow in assessing military utility. The study suggested that DUSD(AT) and the Joint Staff determine a policy and process for assessing utility and the definition of required criteria to use in the process. [Ref. 77:pp. 58-59]

These lessons learned are not all-inclusive but are intended to highlight the major concerns expressed from some of the current and completed ACTD programs. Program lessons learned lay the groundwork for future policies. The principal issues involved in these lessons are addressed in Chapters IV and V of this thesis in examining ACTD contracting methods currently employed and recommendations for future ACTD programs.

2. Transition to Acquisition Issues

As previously stated, the goal of all ACTDs is to demonstrate military utility and transition into the formal acquisition process to begin the procurement in sufficient quantity to meet the operational requirement. [Ref. 61:p. 1] Nearly half of the 46 ACTDs that were initiated between 1995 and 1998 are currently expected to transition to residuals, meaning that there is no plan to move into the formal acquisition process. [Ref. 59:p. 5] While the transition only to residuals does not include all the issues associated with formal acquisition, it does share many of the same difficult challenges. [Ref. 58] The major procurement, funding and supportability issues and lessons learned in ACTD transitions to acquisition are discussed below.

a. *Requirements and the Procurement Plan*

The ACTD program is one that is tailored to achieve an end objective and not just a demonstration. The management plan is set up to be flexible to help achieve that objective, whatever outcome is anticipated. Two major components of an ACTD Management Plan are the system requirements and procurement/contracting plans. [Ref. 29, Slide 4] Team coordination is vital to the completion of these components as the ACTD Technology Manager (designated by the Lead Service) leads the Acquisition

Strategy Working IPT (WIPT) while the User-Sponsor leads the Requirements WIPT. [Ref. 29, Slide 5] The Lead Service has the responsibility of developing and finalizing the ORD. [Ref. 63:Slide 17]

The requirements for a transitioning ACTD program's system should be defined in the ORD. [Ref. 61:p. 19] The ORD should incorporate any cost/performance trade-offs that were made in the process. [Ref. 63] As the ORD is developed there should also be a concurrent system performance specification constructed. A final system performance specification can then be generated that can be used as a functional configuration baseline to begin the follow-on procurement and production efforts. [Ref. 61:p. 19] Following a system's successful showing of military utility, the baseline that develops should reflect the capability of the prototype. [Ref. 29, Slide 6] Since ACTDs characterize system performance instead of working off established requirements, the final requirement and procurement plan cannot be set until the ACTD is complete. [Ref. 52]

The Procurement (or Contracting) Plan for an ACTD is tailored to the particular circumstances associated with that ACTD. The procurement strategy should include both ACTD and post-ACTD objectives and remain flexible to adjust to circumstances that may cause a deviation from the original objective. [Ref. 61:p. 12] The strategy should also incorporate competition early in the process and continue to use the influence of competition throughout the program's existence. One way this is being done is to conduct a competition at the start of the process and retain multiple contractors in the early phases of the program. [Ref. 66:p. 19]

Any contracting strategy should address how DoD would procure further units of a system if that becomes DoD's decision at the conclusion of the ACTD. The Office of the Secretary of Defense (OSD) recommended three contracting strategies that may be employed to deal with such eventualities. [Ref. 61:p. 12]

The first recommended approach is to obtain priced options for production of additional units up front when the competitive offers are being solicited. These options should include Federal Acquisition Regulation (FAR) and Defense FAR Supplement required terms and conditions. The conditions of the options would have to be clearly defined in the ACTD Management Plan and solicitation for bids. Priced options are best applied when the technology at issue is significantly mature and there is little expectation of design changes. However, the onus is on DoD to determine the maturity level of the technology so that the risks placed on the contractors are not unreasonable. [Ref. 61:p. 12]

The contracting method of priced options presents several advantages and disadvantages. One advantage of this method is that the process is competitive in nature versus a negotiated settlement conducted further in the ACTD process. Another advantage is the reduction in procurement lead-time and avoidance of disruption in the procurement process. [Ref. 61:p. 12] The disadvantages of the priced option include the possibility of placing too high a production cost risk burden on contractors. This could result in lessened competition or possible default further into the process. Another disadvantage is the limitation of the method to only those ACTDs with extremely mature technology to demonstrate. [Ref. 12]

The second method recommended by OSD is to solicit non-binding information from contractors on future production pricing. DoD could then use this information to analyze the issue of affordability in the source selection phase. This is seen as a more viable contracting method when the system is more likely to incur some design or configuration changes. The solicitation would state that future contracts for production would be conditioned on the contractor proposing prices that are equal to or less than those initially provided. This method presents the same opportunity to receive the benefits of competitive bids that the priced option afforded but would still require the Government contracting officer to obtain proposals and negotiate prices. OSD contends that this method would take more time and effort than exercising an option but would be less burdensome than negotiation a typical sole source contract. [Ref. 61:p. 12]

The final contracting option recommended by OSD involves the occasions when the ACTD program is to enter a development program at the conclusion of the ACTD. The program may arrive at this juncture either by design from the outset of the program or after the ACTD resulted in a conclusion that further development was required. The option at this point is to either contract sole source with the ACTD contractor or to compete the development program. OSD does not advocate one over the other but recommends the following matters be considered in the decision making process. Contracting Officers should consider whether competition exists, the size of the development effort, the cost and quantity of systems to be procured, the degree of soundness of the design of the ACTD system, and whether DoD owns the ACTD data, design or hardware property rights. OSD guidance suggests the competition option when the need for significantly changed designs or a new system is required. This is

recommended since the pricing obtained from the ACTD would be invalid and a sole source justification would not exist. [Ref. 61:p. 12]

The objective of contracting for ACTDs is to get capable systems to the operational users quickly while emphasizing affordability at every step of the process. The challenges exist in shortening procurement lead-time, translating objective requirements into contract specifications, planning for transition and incentivizing affordability in the contract. [Ref. 11]

The challenge to reduce procurement lead-time is part of an overall mandate to reduce cycle time for procurement in DoD. [Ref. 46:p. 79] Whether in ACTDs or the traditional acquisition process, where cycle time can be driven down, cost and quality will improve. "So the bottom line is that *time is a precious commodity and has value* – it is true every time a new product arrives in advance of the competition." [Ref. 13:p. 176]

The ACTD contracting challenges related to requirements production have been discussed earlier in this chapter, however some recommendations have been made regarding this issue. The importance of teaming in the development of the requirements is critical to establishing an ORD. Teaming keeps the principal stakeholders informed and involved as the requirements change. This allows early planning and collaboration among the CINC Sponsor, the contractor, the acquirer, OTAs and other users, in joint endeavors. [Ref. 29] Another recommendation is to thoroughly document changes made to the requirement at every step of the process. Also at issue are the trade-offs of cost and time for performance. These trade-offs can delay final requirements formulation and thus impact the contracting for production of the system. [Ref. 11]

Transition planning, especially in the contracting phase, is vital to maintain momentum in the ACTD program's progress. [Ref. 11] It has been suggested that this planning can be best accomplished with the addition of a Transition Manager to the ACTD management structure. The downside of this recommendation is the cost in money and manpower for such a role to be filled. But as stated by Arthur L. Money, Assistant Secretary of the Air Force (Acquisition), "ACTDs must have a Transition Manager from the get-go – and to those who say you can't afford it, I say you can't afford not to do it." [Ref. 53]

The final challenge mentioned is the issue of affordability. The contracting officer must address affordability early and often in the process. If the affordability is a barrier to acquisition this should be addressed in the ACTD solicitation. Cost drivers should be identified and attacked in the ACTD formation (alternate concepts), the contract itself (unit price objectives or affordability incentives), the design (allowing CAIV-based trade-offs), and in the utility assessment (cost effectiveness of system capability options). [Ref. 29, Slide8]

The ACTD transition issues of contracting, especially in the area of affordability, and requirements definition are moot if the funding of the ACTD is not accomplished. This vital element of any acquisition program is discussed below.

b. ***Supportability and Funding***

Supportability issues pertain to the contemplation and planning of logistics and training support for the ACTD through the tests and residual capability period. There may be considerable funding set aside for supportability. The items delineated include

contractor support/spares, safety, transportation and environmental concerns. [Ref. 61:p. 14]

The principal issues revolve around the outcome of the acquisition decision. As previously discussed ACTD residuals are funded, including support, for a period of two years following the completion of the ACTD. If the goal or expected outcome of an ACTD is for only the residual, the contracting of Contractor Logistic Support (CLS) would save work efforts in the area of training documentation and development. Another supportability issue is the design configuration for the system and its compatibility with existing systems. By contracting for similar design and compatibility DoD can streamline maintenance and operational training, saving time and cost in the process. [Ref. 61:p. 14] Careful planning in the area of supportability should target "affordability gains" for future systems, reflect maintenance and design tradeoffs, and introduce required supportability "estimation methods into the acquisition process while incorporating personnel-related considerations". [Ref. 60:Sect. 3.2.3.2]

There are many issues regarding the funding aspects of ACTDs. The central issue here is the amount and timing of funds available for the ACTD and any follow-on acquisitions. Funding considerations are quite evident early in the ACTD process. Before an ACTD candidate can be selected there must be sufficient funding available to conduct the demonstration and provide technical support for the first two years after fielding the system. [Ref. 33:p. 4] However, for selection to occur there does not have to be a commitment for out-year funding beyond the residual phase. [Ref. 52, Slide 14] Even when there is dedicated funding there is no guarantee that the funding will stay in place for the duration. Mr. Larry Lynn, the Director of Advanced Research

Project Agency in 1995, noted, "It's a commitment. Of course there is no such thing as an irrevocable commitment, but to the extent you can, it is an agreement by all the players." [Ref. 43:p. 10] One recommendation to gaining and maintaining these funds is to "market" the ACTD continually. By keeping stakeholders up-to-date, scheduling periodic events and publicizing the results, the project remains viable for funding. [Ref. 23:Slide 9] There could still be problems though, especially in this period of highly restricted defense budgets where the joint endeavors pose a significant problem. If in the development of the project, one or more of the Services decides to back out, this could leave the program requiring full support from the remaining Service(s). This was the case in the Counterproliferation I ACTD where the lead Service backed out and the remaining Service was without adequate funding. The result was a significant reduction in the scale of the ACTD program. [Ref. 9]

The central funding issue involves the planning for stable funding throughout the ACTD including the transition to production. Remember that the goal of an ACTD is getting a needed capability to the warfighter in rapid fashion that can result in both time and cost savings. The notion of speeding technology to the warfighter is hampered however by resource and budget constraints. The primary constraint is the inability to perform the timely programming of funds during the appropriate Program Objective Memorandum (POM) cycle. [Ref. 61:p. 16] The typical POM schedule is planned two years in advance. The most ambitious ACTDs can miss a POM cutoff for out year funding at its inception. [Ref. 28]

The compressed schedules of ACTDs also mean that there is little time existing for work-arounds and any unstable funding could create delays by disrupting

ACTD progress. In a worst case scenario these delays and disruptions could cause a lack of interest and support for the program. ACTD programs must stay on schedule to meet their objectives and remain viable. [Ref. 77:p. 59]

As discussed in Chapter II, RDT&E funding for ACTDs currently come from two sources: 1) Lead Military Departments/Agencies who supply the underlying technology funding provide the bulk of the funding, and 2) OSD can supplement the Service/Agency funding to help cover ACTD integration expenses and residual capability technical support. [Ref. 7] Through the 1995-1998 period an average of $800 million per year has been spent on ACTDs. Only a small portion of those funds ($77 million in 1998) were provided by the DUSD(AT). [Ref. 59:p. 8] Funding is to be reviewed annually by the joint managers who will submit reports and recommendations to the Oversight Panel for review and concurrence. [Ref. 34:p. A22]

The type of funds used to support the ACTD programs are varied. Depending on the Agency or Service's interpretation of the maturity level of the technology the funding may be provided from different budget categories within each Agency or Service's budget. [Ref. 16:p. 17]

> For example, officials in the Army's science and technology community consider a project mature only if it can be readily put in the field. Their Navy and Air Force counterparts take a more flexible approach, citing as mature any technology currently in an Advanced Technology Development program (part of budget category 6.3) or lying outside the very early phases of the research and development (R&D) process. (DoD categorizes R&D funding as 6.1 through 6.7 to signify whether the work is closer to understanding underlying science [6.1], well down the road toward engineering a new piece of equipment [6.4], or modifying systems that are already being operated in the field [6.7].) Most sources of funding for ACTDs fall under categories 6.3 and 6.4; however, much of Defense

> Advanced research Projects Agency's early funding for ACTDs selected in 1996 fell under budget category 6.2, applied research. Until recently, the services have occasionally contributed a small amount of 6.2 funding toward certain projects. [Ref. 16:p. 20]

To help address many funding issues, OSD has created a Road Map for ACTD Transition funding. This "Road Map" states that the "Lead Service will, at the appropriate time, define and establish a funding methodology for effective insertion of the ACTD follow-on acquisition into the resource allocation process". [Ref. 61:p. 18] For the initial funding the DUSD(AT) will approve funding provided by OSD and will appoint the Technology Manager as the individual responsible for the execution of all funds associated with the ACTD. [Ref. 61:p. 18]

OSD also recommended three methods for the funding of follow-on acquisitions given differing ACTD planned objectives and outcomes. These funding situations and recommendations are listed below:

> 1. High Military Utility-No Resources Programmed - Decrement Another Program(s).
>
> When an ACTD is judged to provide significant enhancement in military capability and no resources have been provided to support the effort, the follow-on funding issue can be presented to the Defense Resource Board (DRB) or Enhanced Defense Resource Board (ERDB) for discussion and resolution. The funding request would ask the DRB or EDRB (for intelligence programs) for funding to support the follow-on to the ACTD. Ongoing programs will have to be decremented in order to provide the necessary funding to support the ACTD. This type of funding strategy should be used when the "urgency of need" warrants rapid acquisition and overrides the formal PPBS cycle.
>
> 2. Military Utility Established-No Resources Programmed - Programming Resources Causes Two-Year Delay.

> The Lead Service programs for resources at the end of the ACTD, assuming that military utility has been demonstrated. This alternative results in funds becoming available two years after completion of the ACTD. In the interim, the residual capability from the ACTD that was left with the user will provide a limited operational capability. However, this means that the continuity from an ACTD to an acquisition program may be broken, and momentum lost.
>
> 3. Assume Success For Some ACTDs-Program Resources In Anticipation Of Follow-On Acquisition.
>
> One way to avoid or at least minimize the break in continuity between an ACTD and the follow-on acquisition program is for the Lead Service to establish, at some point during the ACTD, a budget line with funding, dedicated solely to acquisition of the ACTD. This approach would be best suited to an ACTD for which the military utility is expected to be high, and where there are early indications that the expectations will be met. If it is possible to establish this budget line two years prior to the anticipated decision point to enter development or LRIP, the break in continuity may be avoided altogether. This funding strategy, of establishing early ACTD specific funding in a RDT&E or procurement line, provides the transition funding bridge to support the follow-on acquisition. If the program becomes a joint program, the Lead Service can transfer the appropriate resources to the designated Joint Program Lead Service for execution. The funding approach will also contribute to overall defense program stability, not having to decrement ongoing programs to "find" necessary resources. [Ref. 61:pp. 18-19]

The Army has already instituted a program that utilizes the ideas and advantages of the third OSD recommendation. The Army has set aside a portion of the yearly service budget to support the Warfighting Rapid Acquisition Program (WRAP). [Ref. 7] Under the directive of the Army all HQDA staff, staff agencies, and material commands are to participate and support WRAP, as appropriate. [Ref. 5:Sect. 1-4]

> WRAP is directed at accelerating procurement of systems identified through Army Training and Doctrine Command

(TRADOC) warfighting experiments (AWEs), concept evaluation programs (CEPs), advanced technology demonstrations (ATDs), advanced concept technology demonstrations (ACTDs), and similar experiments where a TRADOC Integrated Concept Team supported by a TRADOC battle lab are directly involved. The review forum used to review these systems is the WRAP Army Systems Acquisition Review Council. [Ref. 5:Sect. 1-4]

c. *Transition to Acquisition Issues Lessons Learned*

There have been numerous lessons learned in the transitioning of ACTDs to formal acquisition. While the issues raised in the preceding sections have touched on some lessons learned, the following list of lessons learned will highlight the major issues and recommendations of the various Services and Agencies:

Lesson: Address supportability in the design of the prototype.

Suggestion: Supportability can be affected by the prototype design. But the need for some supportability of the system may also have an effect on the design (e.g., Needs to be transported by a C-141) and therefore require up-front communication to industry.) [Ref. 29, Slide 11]

Lesson: Some supportability items are not required for a demonstration and can be deferred until the transition to residuals or possibly until full production. [Ref. 29, Slide 11]

Suggestion: Clearly express to industry via the Request for Proposal (RFP) the goal of transition (e.g., into LRIP) and ask the bidders to express their plan to ensure supportability at each phase. [Ref. 66:p. 20] Collect supportability data throughout the process and include an ILS option to prepare for supportability items that can be deferred. [Ref. 29, Slide 11]

Lesson: Create and foster strong competitive pressures in the areas of cost, schedule, and technical performance throughout the ACTD program.

Suggestion: Hold a major competition at the start of the ACTD. In these cases the cost risk is lower and the program needs to keep momentum. [Ref. 29, Slide 10] Do not down-select too soon in the design phase to preserve competition and keep affordability goals viable. [Ref. 1] Keeping competition in the program is difficult. After going sole source, the Predator ACTD contracting officers attempted to incorporate competition and were not successful. [Ref. 64]

Lesson: Industry has shown that they can make trades in their design that result in life cycle cost reductions for DoD later.

Suggestion: The key is to "build in life cycle costs as an evaluation factor". [Ref. 1]

Lesson: Use the competitive influence created at the start to your advantage in planning the potential follow-on acquisition.

Suggestion: Make use of options or unit price thresholds to keep costs down. Stress the retention of military utility as a major pre-requisite for follow-on acquisition to ensure technical performance levels. Incentivize and stress the importance of cycle time to keep to tight schedules. [Ref. 29, Slide 10]

Lesson: Develop and communicate your contracting strategy clearly to industry as early as possible.

Suggestion: Early communication will afford industry the opportunity to judge the risks and rewards to make more informed investment decisions. [Ref. 66:p. 19]

Lesson: Stable funding is a key to maintaining the momentum of the ACTD.

Suggestion: Future ACTDs should seek to maintain funding stability throughout the life of the ACTD. [Ref. 77:p. 59] The ACTD should be "marketed" continually to ensure the viability of the program is broadcast to the appropriate stakeholders. [Ref. 23:Slide 9]

Lesson: Early transition planning is a key to success.

Suggestion: Ensure that the stakeholders, especially the Lead Service, are committed to prepare for transition and follow through with the plan. The Lead Service must prepare for the acquisition decision, develop and finalize the ORD, and prepare for and support the appropriate milestone decision [Ref. 63:Slide 17]

Again, these lessons learned are not all-inclusive but are intended to highlight the major transition issues involved in current and completed ACTD programs. Principal issues discussed in these lessons learned are addressed later in this thesis in examining ACTD contracting methods currently employed and recommendations for future ACTD programs.

C. CHAPTER III SUMMARY

Chapter III of this study provides an introduction to and explanation of the possible outcomes that can result from an ACTD. After a showing of military utility the ACTDs can transition to full production and take the form of a formal acquisition. This transition can occur with no changes to the prototype design, limited changes to the prototype design, or after further development of the concept or system. Not all ACTDs transition to full production. Some ACTDs have proven military utility and are sufficient

in quality and quantity as presented from the demonstration. Others may prove to have military utility but there may be no priority military requirement for the capability demonstrated. A final outcome that may result is that the ACTD showed no military utility. In these cases the ACTD program is simply terminated.

Chapter III also examines the major issues involved in the transition of ACTDs to production. The discussion is broken into issues involved in testing and trial of the ACTD to determine military utility and the transition supportability and procurement issues. Military utility issues includes an examination of the principal players involved in the evaluation and the three principal questions that must be satisfied for any ACTD program: Does the system do what it is intended to do? Is the system suitable for use by the intended user? Does the system provide capability that satisfies a priority need of the military?

Testing and Trial issues are examined and the major players and their respective roles and responsibilities are identified. The principal players in the process are the warfighters who will actually conduct the ACTD and assess its ability to meet the needs of the military. Also discussed are the OTAs and their capability to assist ACTD managers and oversight groups throughout the process. The major issues of ACTD testing and trials are discussed including critical role trade-offs play and their effect on costs, schedule and performance. Lessons learned from various ACTD sources were included to highlight the issues discussed and provide points of data for analysis in the contracting for ACTDs currently and in the future.

Major issues involving the transition of ACTDs to formal acquisition are examined in the critical areas of requirement definition and the procurement plan. Before

any ACTD can successfully transition to and enter the formal acquisition process the requirements must be defined. Getting to that final determination can take many routes and pose problems for a contracting officer in the planning for transition. Also facing a Government contracting officer are a myriad of issues which call for the anticipation of and planning for the outcome of an ACTD. Discussed are the issues faced in dealing with the purchase of an ACTD while maintaining competition advantages and an uncertain funding situation. The primary methods of contracting discussed were the use of options, the inclusion of non-binding price quotes that could be used for evaluation and deferred sole-source contract and finally the competing out option at the end of an ACTD.

Funding and supportability issues are also examined. The principal methods of planning for a smooth transition are discussed. One method discussed was to insert a budget wedge in anticipation of successful ACTDs. A second method requires the prioritizing of requirements and making use of available funds to the decrement of current programs. The third follow-on procurement budget method was to seek and program funds after a showing of military utility, recognizing the two-year lag time that exists using this method. Chapter III concludes with another list of lessons learned from current and former ACTDs regarding transition to acquisition issues.

Chapter IV further explores the Classes of ACTDs. Various examples of each class of ACTD are used to further explain the differences between the classes. The ACTD examples are also examined to determine the contracting methods employed to contract for the ACTD and, where applicable, the transition to full production. The contracting methods are analyzed for their relative effectiveness, success or failure.

Other contracting methods are examined as well with some analysis regarding their potential applicability for use in each class.

IV. CONTRACTING METHODOLOGY IN ACTD CLASSES

The Office of the Secretary of Defense, to aid in the organization and management of ACTDs, established and defined three classes of ACTDs. [Ref. 77:p. 15] Chapter IV provides a detailed analysis of the three classes of ACTDs, which are divided, based on the type of technology they engage and the intended long-term direction of the program. [Ref. 16:p. 12] Specific examples of ACTDs are given for each of the three classes. The specific examples, with the exception of the High Altitude Endurance UAV, are the ACTDs that have, as of September 1998, completed the demonstration phase of their respective programs. Each example is described with an emphasis on the distinguishing characteristics of the specific program. Following the description of each class and example ACTDs, an analysis is conducted of the various contracting methods that have been, are being, or could be used in the class. The analysis includes an examination of why certain methods were used in various contracts as well as an evaluation of the methods' effectiveness in addressing program risks and goals.

The method of data collection for the following discussion included personal and phone interviews of key personnel involved in completed and current programs to ascertain further insight into ACTD processes, challenges, and lessons learned. Interviews were conducted with a variety of individuals that principally included DUSD(AT) Staff, Service and Agency Contract Managers, and individual programs' Operational and Technology (formerly Demonstration) Managers. The interviewees were given the option to express their observations and opinions on a non-attribution basis to allow for a more informative critique of ongoing programs. Appendix B provides initial points of contact from which the researcher received much of the

information that follows. Appendix C is a table that lists the results of a survey conducted by the researcher to determine the contracting strategies and contract types employed by the various ACTD programs.

A. CLASS I ACTDS

1. Description of Class I ACTDs

Class I ACTDs are described by the DUSD(AT) as typically being "information systems with special purpose software operating on commercial workstations" [Ref. 61:p. 6] Generally, Class I ACTDs involve systems that are required in small quantities and often the military need can be filled with little or no further development or production required. The post-ACTD phase will typically include only residual assets produced during the demonstration program. [Ref. 34:p. A32]

2. Representative Class I ACTDs

Completed Class I ACTDs include the Advanced Joint Planning ACTD and the Synthetic Theater of War ACTD.

a. *Advanced Joint Planning (AJP) ACTD*

(1) Description. Completed in early 1998, the Advanced Joint Planning ACTD developed and demonstrated the capability "to integrate, organize, analyze and present joint readiness data for all CONUS based forces". [Ref. 2:p. I-4] The ACTD, instead of developing new technologies, sought to exploit a variety of existing information-based services. These services were to be used to improve operational planning capabilities by including the most capable and useful technology for Battle Staff Command and Control (C2). The goal of the technology integration and development is

to allow U.S. Forces to quickly assess total force readiness and to coordinate force deployment within a collaborative environment. [Ref. 4:pp. 1, 8]

The AJP ACTD program is supported by the User-Sponsor, the Commander-in-Chief, U.S. Atlantic Command (CINCUSACOM) as well as the Defense Advanced Research Projects Agency (DARPA) and DARPA/Defense Information Systems Agency (DISA) Joint Program Office. DARPA is the lead development agency and the executive agent for daily management of this ACTD. [Ref. 4:pp. 1, 9]

(2) Contracting Methods Employed. According to program executives, one of the goals of the program was to exploit a variety of existing information-based services instead of developing new technology. In furtherance of that goal the managers of the AJP ACTD used pre-existing contract vehicles to supply the system software required for the ACTD. Some new system integration software was contracted for by extending existing software development contracts. The contracts that were already in place were predominately Cost-Plus-Fixed-Fee (CPFF) contracts. A CPFF contract is a cost reimbursable contract that pays to the contractor costs and a negotiated fee that is established at the beginning of the contract.[1] The extension of the AJP ACTD contracts did, in some cases, include adjusted fee amounts.

Research revealed that the AJP ACTD was not planned to transition to formal acquisition. Residual capability was planned to be transitioned through DISA into the Global Command and Control System cores services.

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[1] Research revealed that the AJP ACTD was not planned to transition to formal acquisition. Residual capability was planned to be transitioned through DISA into the Global Command and Control System cores services.

b. *Synthetic Theater of War ACTD*

(1) Description. The Synthetic Theater of War (STOW) ACTD goal is to demonstrate, under operational conditions, Advanced Distributed Simulation (ADS) technologies that will serve to support joint training and mission rehearsal. This program is an attempt to use technology to adapt to new military strategy that emphasizes coordination of joint military crisis response. The program also seeks to find the most cost-effective methods to conduct joint military training and demonstrate how a simulated battlespace can be employed in a myriad of joint missions. [Ref. 76:p. 1]

The STOW ACTD has thus far been successful in demonstrating and evaluating the capabilities of ADS technology to improve joint training and mission rehearsal.

> Specific objectives achieved in Unified Endeavor 98-1, a Joint Task Force level exercise in October 1997, included a demonstration of enhanced simulation fidelity based on combat resolution at the weapons system level; realistic simulation of command and control behavior; networking and information flow technology; and the capability to provide knowledge-based autonomous forces in simulation with man-in-the-loop participation wherever desired. The system supported up to 8,000 entities illustrating a new milestone in simulation scalability. The combination of STOW's successes with C4I, environmental, knowledge-based force integration, and the common data infrastructure demonstrates a significant potential for using simulation with lower cost and greater efficiency in the training, mission rehearsal and analysis required by Joint Vision 2010. [Ref. 2:p. I-5]

Like the AJP ACTD previously discussed, CINCUSACOM is the User-Sponsor and DARPA is serving as the primary developer for the STOW ACTD.

(2) Contracting Methods Employed. The STOW ACTD consisted of several components. The main component was the System Engineering, Integration, and Demonstration (SEID) which would call for a contractor to act as the Lead Integrator for the system demonstration. According to a program manager, this portion of the ACTD program involved solicitation via a Request For Proposal (RFP)[2] and resulted in a highly competitive traditional acquisition process with multiple awards. The candidates' proposals were reviewed with an emphasis on risk management and resulted in the selection of two integrators. One contractor involved proved superior and eventually received an increased role in the program. Both contractors were operating under a CPFF contract.

The Synthetic Environment development portions of the program were sole sourced to a Federally Funded Research and Development Center (FFRDC). The decision to use a sole source commitment in this case was to allow for sufficient Government oversight on a project with a short lead-time.

The remaining software contracts were solicited via a Broad Agency Announcement (BAA). [3] This provided a great deal of competition and resulted in CPFF contracts for contractors submitting successful proposals.

The STOW ACTD was not intended to transition to formal acquisition. Based on results from the final data assessment in May 1998, STOW

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[2] The solicitation methods in this research will not be explained in depth. For further information and explanation of these methods please consult the Federal Acquisition Regulation Parts 14 and 35.

[3] A BAA is an announcement of a federal agency's general research interests which invites proposals and specifies the potential award's general terms and conditions. More information on BAAs and their application can be found in FAR Part 35.016.

residuals are transitioning to the Joint Simulation System (JSIMS) and Service simulation systems.

3. Analysis of Contracting Methods Employed in Class I ACTDs

The two representative ACTD programs chose to use CPFF contracts as their principal contract type. Sources from both programs commented that these ACTDs are R&D in nature and that there is a necessity for some type of cost reimbursable arrangement. The uncertainties in the estimates of total cost in software development generally preclude the use of any type of fixed price contract vehicle. Provided there is sufficient oversight and cost determination systems in place the cost-plus methods are preferable.

According to one Contract Manager, the use of a CPFF contract was a mistake. It was a perceived lack of control over the contractor that caused the concern. The program found it difficult to keep the contractor's attention on cost and the focus of the development. The developer was late in producing contract "deliverables" and took some seemingly needless direction with the program software. The Contract Manager felt that some incentive should be included in the contract to keep the contractor focused.

The recommended contract type given by the contract manager was a Cost-Plus-Incentive-Fee (CPIF) contract. In a CPIF contract the target cost, a target fee, minimum and maximum fees, and a fee adjustment formula are negotiated between the parties to the contract. The Government establishes contract performance objectives. The actual amount of fee paid to the contractor is based on the formula and the contractor's performance in relation to the objectives that were established. The objectives in this type of arrangement are typically related to cost, schedule and/or performance. Where

some realistic objectives can be established, the CPIF arrangement could be successful in allowing the contracting officer to set the priority for the contractor and provides a way to incentivize contractor performance.

The typical application for this type contract for systems in first run production or similar situations where the system is in an advanced stage of development. The difficulty in using a CPIF contract in Class I ACTDs is that the development of software has proven to be difficult to estimate in terms of schedule and only marginally better in terms of cost and performance. For the same reasons it is difficult to enforce scheduled deliveries and keep the contractor on focus, it is difficult to develop the finite measures required to properly incentivize the contractor under a CPIF contract.

While no Class I ACTD program was found to use a Fixed Price contract for software development, some did utilize Commercial-Off-The-Shelf products in the procurement of the system. These buys were primarily to facilitate the overarching development and integration of hardware systems. As a primary means of acquisition this is not a feasible method as the ACTD process usually involves some new technology and development, which will not be satisfied by commercial products.

One contract type not found in use but that could be successfully implemented in Class I ACTDs is Cost-Plus-Award-Fee (CPAF). In these contracts there is usually a split fee. One part is a fixed, base amount while the second portion is an award amount. While the base fee will not vary, the contractor may earn, during the course of contract performance, all or part of the award amount. The amount to be awarded is determined by the Government's evaluation of the contractor's performance based on the elements of criteria expressed in the contract. The criteria that are used to evaluate the contractor can

vary from contract to contract and the weight of each criterion may be changed within a single contract if the Government deems a shift in incentive emphasis is warranted. A decision to award all or part of the fee is a unilateral decision of the Government.

A CPAF contract can provide a great deal of leverage over the contractor to influence a certain performance level sought by the Government. Like a CPIF contract there is monetary incentive and emphasis placed on a particular aspect of contractor performance. Unlike a CPIF contract this incentive factor can be based on an intangible measure. This allows the Government contracting officer to incentivize performance in situations, like software development, where the technical development of a system is not significantly advanced. The use of a CPAF contract would best be applied where the mission is well defined but the performance measures are not. In these cases the program managers can use subjective assessments instead of formula driven measurements that exist in CPIF contracts.

One concern with CPAF contracts is that the requirement for ACTD staffs to conduct the assessment required of this type of contract can cause a serious administrative burden. This would further exacerbate a problem expressed by one Technology Manager that ACTD staffs, "are already working with skeleton staffing". Another point of concern with CPAF contract management is handling the fee not awarded at each evaluation. The decision must be made whether to roll the money forward and provide the contractor "another bite of the apple" or to extract the funds from the contract permanently. Either decision poses additional administrative burden. According to one of the DUSD(AT) executives the funding for ACTDs has been stable compared to other acquisitions. But the executive warned that as the program matures

the funding could become less stable and that contract monies withheld could become fair game for budget cuts.

Since Class I ACTDs have a significant degree of uncertainty in the areas of cost, schedule and performance the researcher concludes that some type of cost reimbursement contract should be used. The application of which type of cost reimbursement contract would depend on the nature and scope of the system being procured. In a purely developmental contract situation the better contract vehicle would appear to be a CPFF since no accurate measure of level of effort could be ascertained. A Class I ACTD involving mature technology or fully developed software application can be conducted under a CPIF contract. In this case, the maturity of the system would allow incentive targets to be assigned to elements of cost, schedule and performance and thus lessen the need to use a CPAF contract type. However, in most cases, a CPAF contract would be the recommended contract type since it affords the opportunity to provide tailored performance incentives in the absence of a highly developed system.

B. CLASS II ACTDS

1. Description of Class II ACTDs

Class II ACTDs were defined by the DUSD(AT) as "stand-alone" systems [Ref. 77:p. 15] The systems associated with this class of ACTD are most closely related to the types of systems typically procured through the formal acquisition process. They are primarily weapon or sensor systems. If military utility is declared these ACTDs will most likely enter the DoD 5000 series Engineering and Manufacturing Development (EMD) production phase of transition or "will be planned to transition into Low-Rate Initial Production (LRIP), following the ACTD". [Ref. 34:pp. A32-A33]

> In many cases a Class II ACTD will be planned to transition into LRIP following the ACTD, but there may be cases where it is appropriate to plan for additional development following the ACTD. For example, if the cost of weaponization is high in comparison to all other costs of the ACTD, the best strategy may be to assess military utility before incurring the full cost of weaponization. In this case the intended point of entry into the acquisition process could be the development portion of EMD. [Ref. 61:p. 7]

Similar to the Class I ACTDs, Class II programs generally have residual assets after the ACTD process is complete, and these are made available to operational users. Like the Class I ACTDs, Class II programs involve a single product and will result in a residual item. [Ref. 77:p. 15]

2. Representative Class II ACTDs

Completed Class II ACTDs include the Boost Phase Intercept, the Low Life Cycle Cost, Medium-Lift Helicopter, and the Predator UAV, the Counter Sniper and the Consequence Management ACTD. Not completed, but included for analysis is the High Altitude Endurance UAV ACTD.

a. *Kinetic Energy Boost Phase Intercept ACTD*

(1) Description. The Kinetic Energy Boost Phase Intercept (KE BPI) ACTD program was established to evaluate the affordability, mission effectiveness and operational utility of BPI engagements of tactical ballistic missiles. The technical approach involved the use of high-speed tactical missiles deployed from air breathing launch platforms such as F-14s. These missiles included kinetic kill vehicles and were intended to intercept ballistic missiles prior to their deployment of submunitions or countermeasures and before they rise above the influence of the atmosphere. [Ref. 45:p. 1]

The joint Air Force and Navy effort took two months and $40 million to conduct. The program efforts entailed the development of a concept of operations, establishment of a simulation of system performance, simulations to measure pilot responses to threat detection, and performance assessment performance based on the number of aircraft equipped with BPI capability. The assessment indicated that the BPI system would be feasible and place reasonable demands on the pilot. [Ref. 2:pp. I-4, 5] The Ballistic Missile Defense Program Review concluded, however, that the program would require an excessive number of aircraft and was not affordable in the current budget environment. The decision was made to forego the $400 million prototype Phase II ACTD. [Ref. 45:p. 1]

(2) Contracting Methods Employed. Following a review of the proposals received, the hardware systems for the Kinetic Energy BPI ACTD were contracted out in parallel. During the development stage there were two contractors, Lockheed-Martin and McDonnell-Douglas. Each contractor was working under a CPFF contract. The Government decided that the scope of the operation would be too great to field and the contracts were terminated. There was no transition contract vehicle in place for this ACTD program.

b. ***Low Life Cycle Cost, Medium-Lift Helicopter ACTD***

(1) Description. The Low Life Cycle Cost, Medium Lift Helicopter ACTD objective was to assess the military utility of using commercial-off-the-shelf (COTS) helicopters to perform Military Sealift Command (MSC) fleet vertical lift support missions. The program, managed by the MSC in conjunction with U.S.

Atlantic Fleet, was assessed during at-sea operations between MSC and U.S. Navy ships August-October 1995. [Ref. 49:p. 1]

The demonstration of leased commercial helicopters and crews was very successful with the Navy concluding that leasing commercial helicopters is a viable alternative to using military aircraft for vertical replenishment. The Navy conducted follow-on demonstrations and is considering the possibility of privatization for the MSC fleet. [Ref. 49:p. 1]

(2) Contracting Methods Employed. The contractual basis was a fully supported lease that included all contractor maintenance and operations with guaranteed performance. The type of contract was Firm-Fixed-Price (FFP) and was awarded on a best value basis following a competitive bid phase.

c. ***Predator Unmanned Aerial Vehicle (UAV) ACTD***

(1) Description. The Medium Altitude Endurance (MAU) UAV, Predator, ACTD was established to assess the military utility of a rapid deployment capable craft for medium altitude reconnaissance and surveillance. The need derived from the absence, at the time, of a national tactical intelligence collection asset that could provide long dwell, near real-time releasable information on stationary and mobile targets. The two principal objectives of the Predator ACTD were to (1) quickly provide a deployment capability within a 30 month timeframe, and (2) develop a concept of operations that could be used for this and future endurance UAVs. The program had a directive to utilize COTS material integration to achieve low costs. The system was to employ ground, air and satellite platforms for cueing and be fully interoperable with existing platforms. [Ref. 51:p. 1]

> The Predator was successfully deployed and operational in Bosnia even before the end of the ACTD and has remained there since. This ACTD was completed after only nineteen months, in June 1996. Mr. Longuemare, Acting USD (A&T), signed the Predator Acquisition Decision Memorandum on 18 August 1997, approving Predator's entry into the low-rate initial production and production rate verification phase of the acquisition process. He delegated milestone decision authority to the Air Force Acquisition Executive. [Ref. 2:p. I-5]

(2) Contracting Methods Employed. Following a competition based on best value, General Atomics was selected among three RFP respondents. General Atomics was a sole source contractor in both the initial ACTD and production phases of the Predator program. Tom Perdue, the Assistant DUSD(AT), commented that that the sole source nature of both initial and transition contracts was unwanted but necessary due to the short-fused nature of the requirement. This, commented Perdue, was the biggest contracting problem involved in this ACTD. [Ref. 64] Without options for additional hardware procurement, or similar arrangements, the Government was forced to negotiate prices on development and production with a contractor that had already been designated as a sole source.

The initial MAE UAV was conducted under a CPFF contract. Shortly after an initial demonstration held under actual operational conditions in Bosnia, a follow-on acquisition was made for an additional UAV under a CPIF contract where the incentive centered on the cost elements of the procurement. The remaining UAVs were procured under Fixed-Price-Incentive (FPI) contract where again the incentive centered on costs.

As discussed previously, Predator was not planned to transition to full production. It was not until after a very successful showing of military utility and

high demand from the users in Bosnia that a transition period occurred. The need for the UAV in Bosnia was so great that the contractual requirement for a demonstration took place in theater in Bosnia. These factors lead to problems that were well documented in a 1996 RAND study. These problems included poor logistics support for operational use of residuals and the difficulty of the sole source contractor to ramp up production to the level requested by the Government. Another problem arose when the Predator's Operational Requirements Document (ORD) was not begun until the end of the ACTD. [Ref. 77:pp. 62-69]

d. ***Counter Sniper ACTD***

(1) Description. The Counter Sniper ACTD was begun in an effort to bring emerging technologies for sniper detection together for evaluation with an eye toward gaining interim capability in a short term period. The principal objectives of the Counter Sniper ACTD were to (1) rapidly provide multiple sniper sensor systems to the military for evaluation, (2) develop skilled users who could evaluate the systems, and (3) be ready to deploy the systems rapidly if necessary. The Dismounted Battlespace Battle Laboratory (DBBL) was the primary user evaluator working in cooperation with the Marine Corps while the Army Research Laboratory (ARL) provided the technical evaluation. [Ref. 19:pp. 1, 3]

Over a short-term (four-month) period ending in November 1996, evaluations of four developing counter sniper system concepts were conducted. The broad range evaluations were conducted with the primary goal of determining the soundness of the technical approach and the system's ultimate utility. Three of the systems had military utility and ten prototype systems were made ready for rapid

deployment with one of the systems deployed in the Olympic Village at Ft. Benning for the 1996 Summer Olympic Games. Due to the success of the demonstrated prototypes, the Army and DARPA are examining additional mobile vehicle-mounted and helmet-mounted counter-sniper detection systems for further development. [Ref. 2:p. I-6]

(2) Contracting Methods Employed. According to a former Demonstration Manager the Government wanted to assess ongoing counter sniper research and development efforts with little or no disruption to those efforts. The emphasis of the contracting effort was on speed due to the short schedule allowed for the ACTD. Therefore contracts were established to achieve close cooperation with contractors and to minimize any engineering changes or additions.

There were no new contracting efforts involved in the Counter Sniper ACTD. The pre-existing programs' demonstrations were evaluated and a "best of breed" competition was used to down select for further evaluation and possible follow-on acquisition.

e. ***Consequence Management ACTD***

(1) Description. The Consequence Management (also known as "BIO 911") ACTD arose from a recognized need for an organized, rapid crisis response and consequence management in the event of a biological warfare (BW) terrorist act in the United States. A domestic BW attack might require a DoD component to be a first respondent that is called upon to coordinate with Federal agencies such as the Federal Bureau of Investigation (FBI) and consequence managers like the Federal Emergency Management Agency (FEMA). DoD and other Services and agencies had only sampling and collection tools for responses. Actual analysis and identification of

specific agent would have to be conducted off-site and after significant delay. The need was then delineated for on-site detection and identification of agents to aid in the timely and effective consequence management of BW attacks. [Ref. 18:pp. 1-2]

The Consequence Management ACTD fully satisfied its demonstration objectives. It showed the military capability to perform in a supporting role for consequence management of BW attacks and to detect and model a simulated BW disaster for consequence management. Participating units adopted the concept of operations developed by the ACTD and will procure favorably assessed technologies. [Ref. 2:p. I-6] The executive agent for the Consequence Management ACTD is the Assistant to the Secretary of Defense (Nuclear, Chemical and Biological). The Operational Evaluator is the Defense Evaluation Support Agency (DESA) while the Dugway Proving Ground is the Technical Evaluator. [Ref. 18:p. 5]

(2) Contracting Methods Employed. The Consequence Management, or BIO 911, ACTD emerged as a demonstration of various state, local and Federal government agencies' ability to react in the event of a biological warfare emergency. According to one of the principal contractors involved in the ACTD, the ACTD was a "large show and tell training session". The predominant contracting method employed the purchase of COTS material from various sources. The sources were Government laboratories and civilian suppliers of chemical testing material. This was a highly specialized and tailored ACTD.

f. *High Altitude Endurance UAV ACTD*

(1) Description. There are no systems currently capable of providing continuous, high altitude, long range, wide area, all-weather coverage of

targets that is sufficient to support a precision strike. The High Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) ACTD was established to address the existing theater airborne asset limitations of endurance, force structure, and access to denied airspace. The specific objectives of the HAE UAV "are 1) to address, to the greatest extent possible, the military high altitude, endurance, UAV reconnaissance/surveillance need at an air vehicle Unit Fixed Price (UFP) of $10M (FY94), and 2) to validate a new acquisition strategy for the HAE UAV System." [Ref. 37:p. 1]

The HAE UAV is comprised of two aerial vehicles, the Global Hawk and Dark Star, and a Common Ground Segment (CGS). The CGS is made up of communications systems, a mission control element, and a launch and recovery element. The Global Hawk is designed for reliable long–endurance flights in a less threatening environment. The Dark Star is designed to be a stealthy, low-observable vehicle that will be employed in a heightened threat environment. Both aerial vehicles are being optimized to achieve a $10 million (FY94) Unit Flyaway Price (UFP). The technologies used in both vehicles have proven effective and are increasingly affordable. DARPA, as the Executive Agent, is emphasizing the use of COTS components and technologies in both programs to achieve the $10 million UFP. [Ref. 37:pp. 2-3, 5]

(2) Contracting Methods Employed. Despite the fact that it has not yet completed the demonstration phase, the HAE UAV was included in the examples of Class II because of the use of Section 845, Other Transaction (OT), contracting methodology.[4]

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[4] For further explanation on this type of contracting authority please refer to, "Authority to Carry Out Certain Prototype Projects", (10 U.S.C.2371, Section 845), Dec 14, 1996.

The intent behind the use of OTs is to facilitate streamlined acquisition and field systems in a shortened cycle. The process is designed to reduce overhead and reduce development and procurement costs. According to the managers of the HAE UAV program, OTs are not contracts in the legal sense of the word, but are an experiment in streamlined acquisition. Irrespective of designation, the OT method of procurement is being used successfully in conjunction with Cost As an Independent Variable (CAIV) objectives ($10 million fly-away cost) in this ACTD to capitalize on the flexibility and presumed benefits of OTs. One DARPA executive explained that the key feature of the HAE UAV program was the maximized emphasis on affordability. The agreements contain no technical requirements or specifications, just a single price requirement. The technical and performance goals are subject to trade-offs that are left to the contractors. With a pre-determined production UAV price, performance is driven by military needs and contractors' desire to meet those needs and thus obtaining a production-buy decision. The contract type now employed is a Cost Share type cost reimbursement contract. This arrangement is CAIV driven and incentivizes the contractors to strive for efficient performance and effective trade-offs that reduce cost but maintain performance levels.

The benefits recognized by a DARPA representative include the lessened likelihood of General Accounting Office (GAO) protests and removal of the need to seek waivers from typical acquisition requirements since these prototype projects are not required to comply with various procurement statutes or parts of the Federal Acquisition Regulation (FAR). OT authority provides the opportunity to Government Contracting Officers to construct agreements that use commercial-like practices. For

instance, DARPA relies upon the contractor's internal auditors to review and certify accounting procedures and documents, augmented by a bi-annual review by independent auditors instead of using of Defense Contract Audit Agency (DCAA).

Another unusual feature of this procurement is the use of a second round of competition after initial award. This is a concern and goal for all ACTD managers but, as the research indicates, is rarely achieved. Phase I of the procurement was a design competition involving a solicitation that requested innovative solutions from industry. The solicitation garnered fourteen proposals from a wide range of contractors. Within three months of program initiation, five awards were made which included CPFF, CPIF and Cost Sharing contracting types. Phase II of the ACTD was established to procure additional systems following initial design review and further development efforts. Phase II was initiated six months after Phase I and the competition was held with past performance as a sole criterion. This resulted in a down selection to two contractors with Cost Sharing as the contract type used with both.

3. Analysis of Contracting Methods Employed in Class II ACTDs

The hardware systems in Class II ACTDs most closely resemble those acquired in major system procurements. As seen in the representative ACTDs, the spectrum of the types of systems demonstrated is broad. The contract types applied in Class II ACTDs are equally varied and are closely tailored to the system being procured. Typically the purchase of hardware systems is accomplished in a variety of methods and appears to defy a systematic application of any particular contract method. However, the ACTD

Program requirement for mature technology might provide an opportunity to provide more restricted guidance as to contract type.

The ACTD process should, as discussed in Chapter II, provide some risk mitigation for a program. ACTDs focus on the use, rather than the development, of relatively mature technology. Due to lower risks in the "core system", the ACTD program's technical risk is significantly reduced. By acquiring mature technologies the Government should, according to the researcher, be able to ascertain sufficient cost data to avoid the contract types involved in pure research and development-type situations, especially in the procurement of hardware.

The level of technological maturity has a large influence on the risk levels involved in any project. Typically with a greater maturity level of technology comes a reduced level of cost and performance risks. While ACTDs do not eliminate those risks in their entirety, they do require relatively mature technology. This may afford Government contracting officers the opportunity to employ, in some cases, a fixed-price contracting arrangement. This circumstance was evident in two ACTDs. The Consequence Management ACTD involved the FFP contract purchase of COTS material. The Low Life Cycle Cost – Medium Lift Helicopter ACTD contract was Firm-Fixed Price (FFP) for a fully supported lease that included all contractor maintenance and operations with guaranteed performance. This contract was awarded on a best value basis following a competitive bid phase. These ACTDs are the exception rather than the rule as they produced no appreciable new technology and only a moderately innovative concept in its demonstration. The other Class II ACTDs involve less mature technologies and would incur significantly more cost, schedule and performance risks. In most cases

the initial application of fixed price type contracts would require contractors to take on an unrealistic portion of the cost risks involved in the process.

Caution should also be taken by contracting officers to avoid a movement too far in the direction of contracts that are best suited to pure research and development. The perils in this type of arrangement can be seen in the contracting for the Kinetic Energy BPI ACTD, which resulted in a parallel award with each contractor working under a CPFF contract. Although successfully demonstrated the Government decided that the scope of the operation would be too great to field and the contracts were terminated. As discussed in the analysis of Class I ACTD contracts, CPFF contracts are best when applied in situations in which there is considerable risk and cost/schedule uncertainty. CPFF contracts provide the contractor little incentive to control costs. This may have contributed to the high costs in the Kinetic Energy BPI ACTD and the ultimate decision to cancel the program despite a successful demonstration of military utility. There was no indication from the research that another contract type could not have been used in this case. Clearly a cost-incentivized contract might have produced a different outcome.

Even where the program feels that the use of a CPFF contract is necessary the program should be able to gain enough information to eventually attain a different contract arrangement, as witnessed in the case of the Predator UAV ACTD. For the second unit purchased the Predator program switched from a CPFF to a CPIF contract, with an incentive on cost. The remaining UAVs were procured under a Fixed-Price-Incentive (FPI) contract where again the incentive centered on costs. While these cost control methods are discussed as a positive course of action, the reader should note that

the motivation of the Predator program to pursue these measures was due, at least in part, to the sole source nature of this acquisition.

Another UAV ACTD, the Tactical UAV "Outrider", though not complete has thus far been conducted with a CPIF contractual arrangement. A full and open competition was conducted, including foreign sources, which incorporated an optional light demonstration in the proposal. The selection of the source was conducted on a best value basis where technical performance outweighed cost in the selection criteria. Cost risks were mitigated by competition, the level of technological maturity involved, and requiring a phased price LRIP option for six additional aircraft. The incentives were primarily on cost objectives. [Ref: 50] Again the level of maturity played a key role in the selection of this contract type. Where the confidence in actual costs is high or competition is keen the onus to incur risk is lifted and the contracting officer is afforded flexibility in choosing the contract type

Another airframe-related ACTD still in process is the Miniature Air Launched Decoy (MALD). This ACTD was established with a CPAF contract. The incentives were primarily on cost objectives and management systems. According to a contract manager involved, the project had high confidence in the cost estimates that provided the opportunity to go through the demonstration phase with a CPAF contract arrangement. It is anticipated and planned that the follow on acquisition in the production phase will be competed again and be awarded under a Firm-Fixed-Price (FFP) contract. The complexity of the MALD airframe and mission is significantly less than that of the three UAVs discussed previously. The lower degree of complexity afforded the ACTD managers a better opportunity to make solid cost estimates with a higher degree of

confidence and provided the flexibility to choose a CPAF contract type. The decision to establish a CPAF contract was also influenced by, in the words of one MALD staff member, "the surprising and consistently low costs quoted in the proposals". According to that staff member the funding problem was alleviated and they could give the contractor some incentive to keep other system objectives in the forefront of the contractor's mind.

The use of Other Transactions (OT) authority in the case of the HAE UAV presents another approach that Government Contracting Officers are pursuing at DARPA. While this authority is not a contract type it does allow the Government flexibility in constructing contracts that use more commercial-like practices. By granting contracting officials relief from parts of the FAR, Congress was seeking to encourage more commercial companies to do business with DoD. The Congressional Budget Office noted that although justification my exist for the use of OTs in ACTDs, the "systematic use of such agreements for ACTDs might raise the issue of whether those projects were receiving sufficient oversight." [Ref. 16:p. 22] Research indicates that there is not systematic use of this authority as the HAE UAV is the only ACTD program exercising section 845 OT authority. This is a contracting strategy option that presents an enhanced opportunity for contracting officials to achieve the cost and schedule goals of the ACTD Program. In achieving the goal of OTs to increase participation from industry, ACTD programs can increase competition in ACTDs and open the door to more new technology insertion for the military.

Research indicates that the transition of ACTDs to full production is more likely to occur in Class II ACTDs than either Class I or Class III ACTDs. Class II ACTDs are

most similar to formal acquisition programs where multiple items are required while the Class I and Class III ACTDs' residuals or mere results, more often than not, serve to satisfy the service or agency's requirement.

To date the Predator MAE UAV is the only Class II ACTD that has transitioned to full production. The research indicates that the program was not properly prepared to go into the production phase. As a direct result of that ACTD, current DUSD(AT) guidance through the ACTD Master Plan now requires candidate ACTDs to identify a planned method of procurement for follow on production units for any ACTD where it is anticipated that the transition to production will occur. The recommended approaches are: (1) to obtain priced options for production of additional units up front when the competitive offers are being solicited, (2) to solicit non-binding information from contractors on future production pricing that DoD could then use to analyze the issue of affordability in the source selection phase, and (3) to either contract sole source with the ACTD contractor or to "compete" the development program in situations when the ACTD program is to enter a development program at the conclusion of the ACTD. The program may plan to compete the development from the outset of the program or adopt the plan after the ACTD results in a conclusion that further development is warranted.

An in depth discussion of the suggested contract methodology can be found in conjunction with transition issues in Chapter III. Also discussed are the relative advantages and disadvantages of the suggested alternatives. Research has revealed that there are insufficient data available to analyze the relative success of the separate transition contact methods at this time.

C. CLASS III ACTDS

1. Description of Class III ACTDs

The DUSD(AT) defined Class III ACTDs as a "system of systems". This class of ACTD program usually involves several "weapons systems integrated within an overarching framework" [Ref. 77:p. 15]. Individual elements within this framework may be a fielded system, a system in acquisition, or an emerging technology. There are often several Program Executive Officers and multiple Military Departments involved in this ACTD class which present integration and coordination challenges to achieving the capability represented in the ACTD. [Ref. 34:pp. A32-A33]

Most of the individual elements of this class of ACTD may already be in use or in the acquisition process for some other function or program. However, a totally new capability may be established by the acquisition and integration of additional elements in to an ACTD architecture. This new capability could then transition into full production for use at a later date. The transition of Class III ACTDs can be challenging to achieve. "The transition of Class III ACTDs is the most difficult from a coordination perspective due to the complexity and lack of precedent for many of the activities." [Ref. 66:pp. 18-19]

2. Representative Class III ACTDs

The two examples of Class III ACTDs which have completed the demonstration phase are the Cruise Missile Defense Phase I and Precision/Rapid Counter – Multiple Rocket Launch (MRL) programs.

a. Cruise Missile Defense Phase I

(1) Description. The Cruise Missile Defense (CMD) Phase I ACTD, also known as 'Mountain Top" focuses on the detection and engagement of cruise missile targets that are beyond the radar horizon. The goal of the CMD ACTD was to prove the operational capability and military utility of detecting, tracking and successfully engaging cruise missiles from ranges beyond the line-of-sight of radar located aboard surface-based air defense units. The ACTD was also to be used to assess joint concepts of operations. Typical for Class III ACTDs there were several agencies involved in the CMD ACTD. The Chief of Naval Research was the Executing Agent for Phase I, while the overall Executing Agent is the Office of Naval Research (ONR) [Ref. 21:pp. 1, 3]

The Phase I demonstration of the various systems was completed in January 1996 and was successful in achieving the program's ACTD objectives. Those objectives included the use of mountain top sensors, surveillance radar, missile fire control tracker/illuminator, and communications to simulate the surrogate airborne platform. Some specific results of the demonstration and operational requirements for future employment are classified. [Ref. 21:p. 1] The concept of an elevated sensor was proven very successful and has been incorporated in cruise missile defense architectures since the demonstration. [Ref. 26:p. 3]

(2) Contracting Methods Employed. The principal system of this Class III ACTD was the radar system and components. The ACTD was established to test the capability of this radar and other systems to address specific operations. There were no new contractual arrangements established in the conduct of the ACTD as all

components were either in current development or previously procured. The connectivity and integration was developed and conducted in-house by Government agencies and services.

No transition to formal acquisition was planned or executed following the demonstration phase of this ACTD. However the CONOPS was evaluated as successful and will be used for possible employment of the technology in the future.

b. Precision/Rapid Counter – Multiple Rocket Launch (PRC-MRL) ACTD

(1) Description.

> The U.S. Army Joint Precision Strike Demonstration (JPSD) began the CMRL ACTD effort by evaluating the total battlefield as a "system of systems" to identify the critical path networks that define the time available to identify and strike high priority, time-sensitive 240mm MRL and 170mm SP Gun targets. Potential solutions were designed, tested and revised, and ultimately evolved into a comprehensive solution comprised of recommended improvements to doctrine, organization, tactics, logistics and materials (DOTLMs). [Ref. 69:p. 1]

The Precision/Rapid Counter-Multiple Rocket Launch (PRC-MRL) ACTD proved its capability by leveraging and integrating various current, emerging, and advanced technologies and resources. The success of the demonstration was illustrated in significant improvements in factors necessary to effectively neutralize the threat. The ACTD showed a reduction in sensor-to-shooter timelines by a factor of three, increased counterfire accuracy, and significantly reduced the PRC-MRL threat to Seoul and to deployed U.S. and coalition forces. These ACTD systems are currently in use and standing watch with the 2nd Infantry Division in Korea. The PRC MRL ACTD was not contemplated to transition into production due to its specialized nature but the

technology from this ACTD is being transitioned into current acquisition program baselines. [Ref. 69:p. 1]

(2) Contracting Methods Employed. The majority of contracts used in the PRC MRL system of systems were extensions of contracts in existence prior to the initiation of the ACTD. Most of the previous contracts were those remaining from a large number of Advanced Technology Demonstrations (ATDs) that had been used in the development of similar technologies. Only one significant element of the ACTD was newly created and competed. This element of the system was awarded using a CPFF contract. One manager involved in the program commented that pre-existing contracts were used with program time constraints as the motivating factor and because the majority of the pre-existing contracts involved similar technology to that sought in the PRC MRL. The pre-existing contracts were primarily omnibus contracts that were extended or expanded to accommodate the additional requirements of the ACTD.

There was no plan to transition the system into the formal acquisition process. The intention was to prove a technology and integration ability. The technology was proven successful and has been incorporated in other program baselines.

3. Analysis of Contracting Methods Employed in Class III ACTDs

Class III ACTDs are essentially a "system of systems" and utilize a great deal of items that are already in use or in the acquisition process under other programs. There is less major procurement and development of products in the Class III ACTD programs than seen in the Class I and Class II ACTDs. This results in the frequent use of pre-existing contracts and less likelihood that the ACTDs will transition into the formal acquisition process.

As previously discussed, the two representative ACTD programs each chose to use pre-existing contracts for the majority of the program procurement and development. Managers from both programs commented that time constraint was the primary reason for the use of the pre-existing contracts. In the CMD ACTD, the radar was the principal element of the program. The radar had been in development for some time prior to the formulation of the ACTD, which was intended to demonstrate an enhanced capability of the radar and linked systems. The ACTD was never intended to leave residuals or transition to production. Precision/Rapid Counter MRL ACTD presented similar circumstances. In both ACTDs the premium was on time as the multiple systems were put together to show a capability and then disbanded. The contracting for an entirely new set of system components would not have met the time objectives and would have proven too costly.

The research indicates that the situation faced by the two completed ACTDs is common. Seven of the eight Class III programs that responded to the researcher's survey indicated that the primary contracting methodology was to use pre-existing contracts (primarily CPFF contracts) and systems. Again, the overriding impetus for this occurrence was to meet schedule constraints. Though they still were required to change contract scopes and negotiate revised targets costs, five program executives listed cost savings as a reason for using existing contracting vehicles. The basis for the cost savings could be found in the administrative costs that were significantly reduced by choosing to extend contracts rather than create new ones.

The typical Class III ACTD environment involves the integration and coordination of various systems in an operational environment. Research has shown that

most Class III ACTDs require some integrating software development similar to the Class I software development items. The scale of development does not appear to be as large in Class III ACTDs. With the scale of the pure development reduced, the contract managers appear to have more flexibility to piggyback requirements on pre-existing contracts rather than create new contracts on a competitive basis. This has proven to be somewhat time effective and thus addresses one of the primary goals of the ACTD process in reducing cycle time.

The extensive use of pre-existing contracts in Class III, while nearly universal, was not without its critics. One program manager commented that it is a shortsighted strategy. The criticism centers on the lack of real administrative time and cost savings and a lack of autonomous control for the program. The extension or expansion of these contracts in many cases created workload and administrative burdens on the Government and industry that were unanticipated and proved costly, both in terms of time and money spent amending the contracts that were already in place. Another drawback of this method of contracting is the detrimental effect on competition, as the extensions are de facto sole source contracts.

One manager commented that if the ACTD program were to be created anew, it would be better for the program to use sole source justification to create a new CPIF contract. This, according to the source, would allow the program to exercise more control over the contractor and afford the contractor the opportunity to deal with a single program and its demands. One concern that was echoed by several Class III program managers was that the use and expansion of existing contracts placed an additional burden on contractors involved in those contracts. The managers noted that the

additional burden involves taking on workload responsibilities that can be as demanding as a new contract requirement and, in most cases, be required to work with and answer to more than one service or agency.

The use of new contracts, whether CPIF or other types of contracts, would be most effective in addressing the performance risks faced by contracting officers and program managers. The ACTD program would place itself in a better leverage position with the contractor. Management personnel in any program must assess the relative administrative and workload burden that would be imposed on any contractor working under a pre-existing agreement with the Government. The degree of complexity of the existing and new requirements would have to be considered along with the cost, schedule and performance objectives of the ACTD to assess whether to seek modifications to current contracts or to form new ones.

The Rapid Force Projection Initiative ACTD is the single responding Class III that is not using pre-existing contracts as a primary tool for the ACTD. Instead, the program used a very decentralized and cost restrictive strategy. The program involved the extensive use of COTS items and highly mature technology in creating almost exclusively FFP contracts. The contracting for the various hardware systems was assigned to the various organizations involved in the process, all with a fixed operating budget. This approach was based on the special nature and circumstances of the program and was highly tailored.

The strategy of using FFP contracts, while effective to achieve the RFPI objectives, is not likely to be applicable to many ACTDs. The FFP contract places too much cost risk on the contractor and would likely increase performance risks and the

chance for contractor default. Even Class III ACTDs involve a great deal of effort that is research and development (R&D) in nature. This R&D, coupled with possible extensive integration efforts, may necessitate the use of a cost reimbursement contract. As stated before, the uncertainties in the estimates of total cost in software development generally preclude the use of any type of fixed price contract vehicle.

D. CHAPTER IV SUMMARY

Chapter IV of this study provides an in-depth description of the three classes of ACTDs. Various examples of each class of ACTD are used to explain the differences between the classes and are examined to determine the contracting methods employed to contract for ACTDs in the particular class. These and other contracting methods are analyzed for their relative effectiveness, success or failure, and general applicability to the ACTD Class.

Class I ACTD programs are described as "information systems with special purpose software operating on commercial workstations". The software procured and demonstrated in this class is usually sufficient to satisfy the requirement of the service or agency. The Class I ACTDs typically do not and are not planned to be transitioned into the formal acquisition process.

The Advanced Joint Planning and Synthetic Theater of War ACTDs were described as the examples of Class I ACTDs. The two programs have completed the demonstration phase of the ACTD and each uses a CPFF type contract. The merits of cost reimbursement contract types; CPFF, CPIF, CPAF and fixed price contract options were examined to analyze whether they would be generally applicable to Class I ACTDs now and in the future.

Class II ACTDs programs are examined and described as stand alone hardware systems which most closely resemble the typical major system acquisition programs. The programs of this ACTD Class are described as those most likely to transition to full production in the formal acquisition process.

Again several examples of completed ACTDs are provided. These examples include the Kinetic Energy Boost Phase Intercept, the Low Life Cycle Cost, Medium-Lift Helicopter, and the Predator UAV, the Counter Sniper and the Consequence Management ACTD. Not completed but included for analysis is the High Altitude Endurance UAV ACTD. The broad range of Class II systems, contact types, and contract strategies are discussed for each example and the strategies and methods are analyzed for their success and ability to achieve the objectives of the individual and overarching ACTD Programs. The contracting strategies and contract types for transitioning ACTDs to full production via the formal acquisition process are also discussed in the Class II ACTD section.

Class III ACTD programs are also examined in Chapter IV. These ACTD programs are described as a system of systems that usually involves several weapons systems integrated within an overarching framework. Class III ACTDs are classified as involving various components that are either already in use or in the acquisition pipeline in another program.

Two completed Class III ACTDs are given as examples of the class. Both the Cruise Missile Defense Phase I and Precision/Rapid Counter – Multiple Rocket Launch (MRL) programs are described and the method of contracting for the programs identified. As with the other classes, the Class II program contracting methods and rationale are examined. The merits of using pre-existing contracts are contrasted with the use of

various cost reimbursement and fixed price contract options were examined to analyze whether they would be generally applicable to current and future Class III ACTDs.

The next chapter provides a summary of previous chapters and this chapter's research, analysis and findings. The primary and secondary research questions are answered. Additionally, this chapter provides recommendations (with comments) that might be employed by Government contracting personnel in contracting for future ACTDs. Finally, Chapter V lists areas for further research regarding ACTDs.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The purpose of this thesis is to examine the contracting methods employed by the Department of Defense (DoD) in the three defined classes of Advanced Concept Technology Demonstration (ACTD) Programs and determine if contracting methodology is a critical decision element in the ACTD process.

The traditional acquisition process was explained and examined with major advantages and disadvantages of the process discussed. The ACTD program and its processes were defined and examined, then compared to the traditional acquisition process to help the reader distinguish between the two and discern the nuances of the ACTD Program. Also identified and discussed were major issues and concerns identified with the ACTD process and transition to formal acquisition.

Each class of ACTD's unique characteristics, lessons learned, procedural and decision processes, and actual or predicted outcomes were considered and used to evaluate the contracting methods employed by DoD in ACTD programs. The reasons for use and relative success or failure of these methods were assessed to determine whether they are required or should be recommended for use in future programs.

B. CONCLUSIONS

1. Primary Research Question

The technological nature and uncertain outcome of Advanced Concept Technology Demonstrations (ACTDs) present unique challenges for

Government Contracting Officers but is the choice of a particular contracting method really critical to the ACTD process?

The results of this research indicate that one must determine exactly what form of system and level of technology is involved in the class of ACTD (or ACTDs in general) to adequately address the question of whether the choice of a particular contracting method is really critical to the ACTD process. The research shows that there are numerous levels of technology on the mature technology continuum. This poses a significant difficulty when one addresses the proper contract type to apply to the acquisition of any given system or class of systems involved in ACTDs.

The existence of highly diverse ACTD programs is indicative of the flexibility sought by DoD when it began the program in 1994. This diversity in systems is matched by the diversity of contracting methods employed. There is a high degree of tailoring required in the contracting process for each ACTD. Government Contracting Officers are using various contract types and contracting strategies to achieve the objectives of the individual ACTDs and ACTD Program as a whole. Though some isolated difficulties exist, the results to date have been successful.

The researcher concludes that the choice of a particular contracting method for any ACTD Class is not critical to the process. Positive results have been achieved using a variety of contract types and contracting strategies. Though some alternative methods might have produced more efficient or cost effective results, the positive results achieved to date obviates the need to prescribe a specific contract methodology to the ACTD process. As with more traditional acquisition programs, the contracting strategy should

be tailored and based upon the requirements and objectives of the particular system and program.

2. Secondary Research Questions

a. What is the traditional acquisition process and what are the relative benefits and disadvantages currently attributed to that process?

The traditional approach to major system acquisition within DoD involves both development and procurement elements. These elements are addressed in a series of four distinct phases. The first of these phases explores the various weapons concepts. The second involves the definition of how the system will look and the shape it will take. The system plans are refined through engineering and manufacturing development in the third phase. In the final phase the system is produced in larger quantities and the operational and logistical support concerns for use in the field are addressed.

This traditional method of development and procurement provides some definite advantages. First, the system has been in place for many years so Government and industry acquisition personnel have a great deal of familiarity with the process. The methods employed in the process have, over the course of time, been refined and amended to best serve the Government's interests.

Another advantage is the amount of review and oversight involved in the formal acquisition process. Oversight and consistent program review can help evaluate and mitigate the risk involved to help serve the Government's and, consequently, the public's interests.

A final major advantage is the ability of Program Managers and acquisition personnel to tailor the process to best accommodate the acquisition. Tailoring allows the use of the traditional risk reduction measures while still working within a familiar and refined process.

This traditional method of development and procurement also presents some challenges and disadvantages. One of the principal disadvantages to the traditional acquisition process is also one of its advantages: the amount of review and oversight. The extensive amount of time involved in these and other traditional DoD acquisition process measures can become laborious and very costly.

The extreme length of an acquisition program can also create a significant competitive disadvantage. By forgoing short-term solutions for longer-term, major systems solutions, DoD can jeopardize the military capability to combat new more advanced technological forces and threats.

b. What is an ACTD?

The Advanced Concept Technology Demonstration program was initiated in 1994 as a way of allowing military services or defense agencies to adapt or utilize new, but mature or significantly developed, technologies to construct prototype systems that address urgent military needs.

c. How does the ACTD acquisition process differ from the traditional acquisition process?

An ACTD is not an acquisition program but was intended to be, and has become, a pre-acquisition activity that allows the user to operate and assess the military utility of a prototype before a decision to acquire takes place. If a decision to acquire

more systems occurs, the program will enter the formal acquisition process at some point downstream from the normal starting point of concept development. ACTDs thus can become a facilitating element to the formal acquisition process.

Differences can be seen between traditional and ACTD acquisition processes in the institution and implementation of acquisition reform measures. The ACTD program was viewed as a core element in improving our acquisition system. It was designed to reduce cycle time and use teaming arrangements and performance specifications to efficiently structure the procurement. An ACTD allows the services and agencies to forego or simultaneously conduct steps of the formal acquisition process.

The difference in acquisition process structure is also reflected in the recording and reporting requirements involved in the ACTD process. The ACTD process has utilized minimal supportability documentation, while the formal acquisition program requires a significantly more supportability data and reference documents.

Another difference between the two processes can be found in the development of the ORD. While both involve continuous ORD development, the ACTD process does not concentrate on a highly intensive up-front effort as seen in traditional acquisitions. Managers of the demonstrations construct or select prototype systems and turn them over to commanders to evaluate the technology in the field. Minor changes based on operational capability or utility can be made that make the prototype more acceptable. The ACTD ORD development can then be made to reflect the design and capability of the prototype.

A final difference in the comparison involves the formal planning for supportability of the acquisition. ACTD residuals include planned support for a period of

only two years. Formal acquisition programs must include supportability plans, logistics support analysis, life cycle cost estimates; ACTD programs do not.

d. What, if any, general contracting method recommendations for Government Contracting Officers can be derived from completed and current ACTD programs?

As discussed in the primary research question conclusion, there are a variety of system types and levels of maturity currently in place in the ACTD Program. The research has clearly established, through the examination of the various classes and systems the need for tailored acquisition procedures to the highest degree possible. This tailoring is essential to afford ACTD managers the opportunity to capitalize on existing technologies and capabilities and to meet the varied goals and objectives of the different ACTD programs.

While the need to tailor the acquisition process to the program objectives is essential, the separation of the ACTDs into the three classes does provide some opportunity to issue some recommendations in the acquisition of the ACTD systems.

Class I ACTDs are primarily software development programs and, as such, present the most uniform alliance in the methodology of contract type employment. The systems involved in Class I ACTDs are very much related to typical research and development efforts and as such will virtually require a cost reimbursement type of contractual arrangement. The specific type of contract should be tailored to the system but the research indicates that the level of confidence in estimating cost, schedule and performance may preclude the effective and efficient use of incentive type arrangements. These systems, though they may involve pre-existing software, still require a significant

degree of development effort and integration with other systems. The typical contract type in this class is a Cost-Plus Fixed-Fee (CPFF) contract. The concern in this type of arrangement is that the control over the contractor is lessened without an incentive arrangement. Government contracting officers should seek to mitigate these concerns by establishing properly tailored oversight, realistic delivery schedules and clearly defined performance specifications and system objectives. The recommended type of contract in Class I ACTDs is a Cost-Plus Award Fee (CPAF)

Class II ACTDs are most closely related to the typical major system procurement situations. The purchase of hardware systems is accomplished in a variety of methods and defies the systematic application of any particular contract method. The Government contracting officer involved in an ACTD in Class II should explore the various methods discussed in this research and devise a contracting strategy that will accomplish the goals of the program and capitalize on the advantages provided in the ACTD Program. The use of Other Transactions (OTs) has, to date, been almost exclusively a function of the Defense Advanced Research Project Agency (DARPA). The flexibility provided in this method of acquisition married with the initiatives of the ACTD Program can be an effective means of dealing with the acquisition of ACTDs and follow-on production. Services and agencies should explore all contract types and acquisition methods, including OTs, in developing the contracting strategy.

Class III ACTDs essentially involve a "system of systems" that requires less major procurement and development of products than the Class I and Class II ACTDs. This results in the frequent use of pre-existing contracts and less likelihood that the ACTDs will transition into the formal acquisition process. With the scale of the pure

development reduced, the contract managers appear to have more flexibility to piggyback requirement on pre-existing contracts rather than create new contracts on a competitive basis. This practice should be continued to a high degree due to the effective achievement of one of the primary goals of the ACTD process in reducing cycle time. This process also allows for pre-existing cost analysis and performance oversight measures to be utilized. The one Class III item for which Government Contracting Officers should consider using new contracts is the integration software that is used to link systems within the ACTD. Research has shown that the scale of software development is not as extensive as experienced in Class I ACTDs but use of new contracts, whether CPIF or other types of contracts, would be most effective in addressing the performance risks faced by contracting officers and program managers.

There are inadequate data from which to analyze the methods employed in the transition to the formal acquisition and production of ACTD systems. However, ACTD programs should, given the high levels of technology maturity required for ACTD selection and to complete initial demonstration, have enough cost level confidence to proceed to follow on production with a contract that places more of the cost risk burden on to the contractor. Programs should develop, from the initiation of the ACTD, cost data that will allow production contracts via the formal acquisition process to be under fixed cost arrangements. The nature of any demonstration program is to reduce the risks in the acquisition process. The buyers in these programs should be more informed and more likely to ensure that operational requirements are met and cost estimates are sufficiently accurate to proceed with a fixed cost contract.

C. RECOMMENDATIONS FOR FUTURE ACQUISITIONS

1. The ACTD process should remain highly flexible in order to achieve the objectives for which it was established.

To begin to institutionalize the ACTD process would run the risk of creating a process that resembles the formal acquisition process. It is that process that the ACTD Program was designed to augment, by allowing mature technology to be inserted into the warfighters hands in a more rapid fashion than was currently practiced under the formal process.

2. The ACTD Program should continue to afford Government Contracting Officers the ability to tailor the ACTD acquisition process to the needs of the particular program.

The wide variety of systems procured and demonstrated in the ACTD Program demands that the acquisition process be tailored to the maximum extent possible. This best affords ACTD management the opportunity to achieve individual and ACTD program objectives.

3. Class I ACTDs should be exercised under cost-reimbursement type contracts.

Class I ACTD systems involve software development which is R&D in nature. To mitigate the Government's cost, schedule and performance risks, contracting officers should seek to use Cost reimbursement type contracts. The exact type of contract should be tailored to the situation based on the program executives' degree of confidence concerning the estimated ACTD cost, schedule and performance levels. To incentivize

the contractor performance and maintain some control in the process the recommended contract type is a Cost-Plus Award Fee contract.

4. Government Contracting Officers should consider the use of Section 845, Other Transactions authority in the contracting for ACTDs.

The flexibility provided in this method of acquisition married with the initiatives of the ACTD Program could be an effective means of dealing with the acquisition of ACTDs and follow-on production. This should not preclude the consideration of other, more traditional, methods when available. The level of oversight is the principal limiting factor in this recommended action. However, the use of sound source selection procedures and validation of contractors' management systems may preclude the need for costly Government oversight and thus mitigate the risk associated with OTs.

5. Government Contracting Officers should use new contracts for integrating software and hardware items in Class III ACTDs.

The overriding concern for most Class III ACTDs is the integration of systems. While it is efficient and proper to use pre-existing contracts in the assembly of ACTDs this practice should not be universally applied. This practice can impose an increased burden on contractors and can result in decreased control over the major factors of cost, schedule and performance critical to the conduct of an ACTD.

6. Government Contracting Officers should seek to use Fixed-Price contracts in the production phase of the program.

While inadequate data exists to analyze the methods employed in the transition to the formal acquisition and production of ACTD systems, the use of fixed price contracts should be sought whenever possible to mitigate the cost risks to the Government.

Beginning with a high level of technology maturity required for ACTD selection and increasing that level through completion of the demonstration, program officials should have enough cost level confidence to proceed to follow on production with a contract that places more of the cost risk burden on to the contractor. Programs should develop, from the initiation of the ACTD, cost data that will allow production contracts via the formal acquisition process to be under fixed cost arrangements.

7. Individual ACTD programs should designate a dedicated Transition Manager to each program.

The level of effort that must be attained to successfully transition an ACTD is more than sufficient to warrant the designation of a Transition Manager and Transition IPT. The exact level of effort and expertise required in the positions will vary from program to program. This will be based principally on the complexity of the technology and whether the program intends to transition to full production. The Transition Manager should fall under the administrative control of the Technology Manager for administrative purposes.

D. AREAS FOR FURTHER RESEARCH

1. The ACTD process was established with a goal of providing military capability to the warfighter in less time than formal acquisition. With some ACTD programs scheduled for completion within two years, this goal is hindered by resource and budget constraints. The primary constraint is the inability to perform the timely programming of funds during the appropriate Program Objective Memorandum (POM) cycle. Since the typical POM schedule is planned two years in advance the most ambitious ACTDs can miss a POM cutoff for out year funding at its inception. A study of the methods used to

obtain and secure funding for ACTDs should be conducted to analyze the most effective methods for future acquisitions.

2. The ACTD process is a relatively new acquisition reform measure. The program began in 1994 with eleven ACTDs initiated in 1995. Originally the duration of these programs was established to be two to four years. The original and subsequent year's programs are nearing the end of their prescribed period of duration. A principal advantage of ACTD implementation was perceived to be a shortened cycle time for acquisition and fielding of systems with military utility to the warfighter. ACTD Program managers are provided flexibility in their operations to achieve this advantage. An evaluation of ACTD programs should be conducted to assess their success or failure in achieving a reduction in cycle time and meeting the goal of getting capable systems to the warfighters.

3. This research has indicated that there is some controversy regarding the goal of the ACTD program and thus the proper direction for candidate and selected programs. The debate centers on whether the mission is primarily meant to promote new technology insertion to the warfighter or to shorten the acquisition process. Also the selection criteria for ACTD candidates have been criticized as being vague and some selected programs have been considered improper. A detailed review of the criteria and ACTD Program objectives should be conducted that will more succinctly identify the goal of the ACTD Program and provide recommendations for selection criteria.

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APPENDIX A: ACTD SELECTION CRITERIA

[DUSD(AT) Guidelines for ACTD Formulation]

1. The timeframe for completing the evaluation of military utility is typically 2-4 years.

This provides ample time to design, fabricate fieldable prototypes of near-term capabilities and to allow warfighters to evaluate them. For less complex systems or systems that are available quickly (e.g. COTS) the timeline may be significantly shorter. Similarly, for very complex systems that require extensive integration and developmental testing, slightly more time may be required. In the interest of avoiding delays in the fielding of new technology, the timelines should be kept as short as practical.

2. The technology should be sufficiently mature.

Unlike Advanced Technology Demonstrations (ATDs), which are intended to evolve and demonstrate new technology, ACTDs begin with mature or nearly mature technology and focus on the question of military utility (value to the warfighter) of a proposed capability. Technology maturity is important for two reasons. First, the nominal 2-4 year timeframe does not allow time for technology development activities during the ACTD. Second, technology development introduces schedule uncertainty, which is highly undesirable. ACTDs often involve force-on-force military exercises involving large military forces. To permit these exercises to be executed according to plan, the systems being employed must be available on schedule. Furthermore, they must be dependable and they must perform as predicted. Technical performance should not be a significant issue during the utility assessment phase. Therefore, new technologies proposed for incorporation into an ACTD should not be in the 6.1 (basic research) or 6.2

(applied research) budget categories. Furthermore, the technologies must have been successfully demonstrated at the subsystem or component level and at the required performance level prior to the start of the ACTD. Alternatively, they can be scheduled for demonstration as a separate effort in parallel with the ACTD. In this case the demonstration must be completed prior to the time the technology will be introduced into the utility assessment phase of the ACTD. Exceptions are permitted under any of three conditions:

(a) The technology is not used in the "performance critical" path of the ACTD and therefore a performance shortfall would not impact the performance of the basic capability being evaluated.

(b) The technology is not used in a "core system". In some cases, ACTDs include in portions of the evaluation phase, an advanced concept that is participating on a non-interference basis. Their performance does not impact the evaluation of the core system. These arrangements represent low cost, piggyback opportunities to evaluate the advanced concepts.

(c) An exception has been granted by the DUSD/AT.

3. Provides a potentially effective response to a priority military need.

The need that is being addressed by the proposed candidate must be clearly supported by the intended user of the capability. During the ACTD selection process, the Joint Requirements Oversight Council (JROC) will review and prioritize the remaining candidates according to military need. Candidate ACTDs should be focused on military needs that are expected to receive adequate priority in that forum. It is also important to confirm that the capability being proposed represents a reasonably cost-effective response

to the need. ACTDs are not required to be supported by an extensive analysis of alternatives or cost and operational effectiveness analyses. However, it is important to consider the alternative approaches and show that the proposed approach offers an attractive near-term capability. This capability should also be designed to allow evolution in response to changes in the threat or in the technologies involved.

4. The User signs up to be intimately involved in the ACTD.

The involvement of a User Sponsor (warfighter) is vital to the success of an ACTD because the assessment of military utility by the warfighter is a key element of the process. In most cases the User Sponsor is one of the Unified Combatant Commands, frequently supported by one or more of their component commands. No ACTD will be initiated without the commitment of a warfighting element to participate fully in the ACTD and perform that assessment. The warfighter must also:

(a). Provide the operational concepts for employment of the proposed capability.

(b). Provide oversight and support of the exercise(s) that will be used to assess utility.

(c). Provide the utility assessment at the conclusion of the ACTD.

The user must reflect a commitment of the resources to perform these tasks in an Implementation Directive.

5. A lead Service/agency has been designated.

With few exceptions, the capability being evaluated during the ACTD will become the responsibility of the services or operational agencies once the ACTD has been completed. The lead service/agency will be responsible for preparing transition of the residual assets to the user organization and for all aspects of their support. Where it is

possible that the utility assessment will result in a decision to acquire more units, the lead service/agency must ensure the necessary planning for transition to formal acquisition has been accomplished. An ACTD will not be approved unless there is a commitment by a lead service/agency to accept the responsibility for preparing the transition at the end of the ACTD.

6. The risks have been identified, are understood and accepted.

Even with the use of sufficiently mature technology, there can be technical risks associated with engineering and integration work to be performed. The more complex the capability, the greater these risks tend to be. In addition, there can be programmatic risks (e.g. cost and schedule), as well as operational risks related to the acceptability of the operational concepts necessary to realize the full benefit of the proposed capability. These risks must be identified and accepted by the primary stakeholders in the ACTD prior to its initiation.

7. Demonstrations or exercises have been identified that will provide an adequate basis for the utility assessment.

The heart of an ACTD is the assessment of military utility by the warfighter. This activity should not be confused with the developmental testing performed in a technology demonstration (TD), in an ATD, or even in the risk reduction (Dem/Val) phase of an acquisition program. It is also broader than normal operational testing. Military utility is defined as: (a) effectiveness in performing the mission, (b) suitability for use by the user, and (c) the overall impact the proposed capability has on the conflict or military operations. Meaningful assessments of effectiveness and suitability require realistic combat environments that will stress both the equipment, and its operating procedures.

In many cases, this requires the use of an opposing force to create realistic and stressful conditions that will provide an opportunity for the full value of the capability to be revealed. The ACTD proposed should either identify planned exercises/demonstrations that will meet the needs or propose new exercises/demonstrations for that purpose. The user is responsible for ensuring the conditions under which the evaluation is conducted are representative of the anticipated operational environment. Although the user is responsible for making the assessment of utility, the user can normally benefit significantly from support by the operational test community. The operational test agencies (OTAs) are well experienced in decomposing top level questions of effectiveness and suitability into specific measures of effectiveness, performance and suitability. They have also offered to provide support to the User Sponsors in planning the utility assessments, in analyzing the results, or both. User Sponsors are strongly encouraged to take advantage of this capability.

The third element of military utility, the overall impact on the conflict, highlights the difference between the ACTD exercises and traditional technical testing. The impact on the conflict is the result of not just the new technical capability, but also the gains which result from effective employment of that capability by the using unit, and of gains in other parts of the battle that result from higher performance of the using unit (e.g. domino effect). The overall impact is the integrated effect of all three factors.

8. **Funding is sufficient to complete the planned assessment of utility and to provide technical support for the first two years of fielding of the interim capability.**

A budget must be developed and submitted as a part of the proposed ACTD. This budget must identify all costs associated with the design and development of the prototype system, all additional units required in the ACTD, all exercises that must be paid by the project, and test support costs including any modeling simulation and analysis needed to support the utility assessment. The budget must also include costs related to planning and preparations for transition into acquisition, as well as the cost to provide technical support for the first two years of fielding the residuals. The lead service is assumed to budget for all support costs beyond that point. ACTD funding is typically provided by the participating technology programs with supplemental funding from the DUSD/AT funding line as appropriate. This OSD supplemental funding is typically about 10% of the total cost of the ACTD and is for (1) integration of the technologies with existing systems for the demonstration, (2) providing multiple copies of system elements where that is critical to the user's evaluation of military utility, and (3) technical support of the residual capability, during which time the user will continue to evaluate the concept during routine training activities and will continue to mature the concepts of operation. Proposals for OSD funding should be coordinated with ODUSD/AT during the formulation phase.

9. **Developer is ready to prepare a plan that covers all essential aspects.**

Within 90 days following approval of an ACTD, a fully coordinated ACTD Management Plan must be forwarded to the DUSD/AT for final signature. The contents

of this plan are defined in the Guidelines for ACTD Management Plans as published in the Defense Acquisition Deskbook and are also available on the DUSD/AT website (www.acq.osd.mil/at). Coordination and approval of this plan early in the ACTD is key to getting all participants onto the same game plan. It is important that the ACTD planning effort be sufficiently detailed and support completion of the plan within 90 days. [Ref. 33: pp. 2-4]

APPENDIX B: ACTD POINTS OF CONTACT / SOURCES OF INFORMATION

NOTE: Demonstration Managers have recently been designated as "Technology Managers" by the DUSD(AT). These points of contact remain designated as Demonstration Managers by their programs.

Advanced Joint Planning (Class I):
Advanced Technology (AT) Staff: CAPT Tom Radich, USN, (703) 697-6446
Dr. Robert McWilliams, Demonstration Manager, (703) 526-6623
LTC Paul Gillis, USMC, AJP Operational Manager, (804) 322-7605
LTC Paul Neal, USA, AJMRR Operational Manager, (703) 693-8192

Kinetic Energy Boost-Phase Intercept (BPI) (CLASS II):
AT Staff: Mr. Tom Perdue, (703) 695-8045

Cruise Missile Defense (CMD) (CLASS III):
AT Staff: Dr. Charles Perkins, (703) 697-3568

High Altitude Endurance (HAE) UAV (CLASS II):
AT Staff: Lt Col Marty Meyer, (703) 614-8436
Mr. Chuck Heber, Demonstration Manager, (703) 524-5199
Lt Col John Wellman, Operational Manager, USACOM/J-RC/J-33,(757) 322-7613

Joint Countermine (JCM) (CLASS III):
AT Staff: CAPT Tom Radich, USN, (703) 695-5036
Col Joe Singleton, USMC, Demonstration Manager, (703) 696-1299
CDR Peter Morford, USN, Operational Manager, (757) 322-5025

Low Life Cycle Cost, Medium Lift Helicopter (LLCCMLH) (CLASS II):
AT Staff: CAPT Tom Radich, USN, (703) 697-6446

Medium Altitude Endurance (MAE) UAV "Predator" (CLASS II):
AT Staff: Lt Col Marty Meyer, USAF, (703) 614-8436

Precision/Rapid Counter-Multiple Rocket Launcher (PRC-MRL) (CLASS III):
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CPT Wil Riggins, USA, Demonstration Manager, JSPD, (703) 704-1527
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Precision Signals Intelligence Targeting Systems (PSTS) (CLASS I):
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CDR Dennis Sorensen, USN, Demonstration Manager, ONR Code 35, (703) 696-5775
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Rapid Force Projection Initiative (RFPI) (CLASS III):
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Air Base/Port Biological Detection (Class III):
AT Staff: Dr. Judith Daly (703) 614-8436
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LTC Mike Urban, USA Operational Manager, USCENTCOM, (813) 828-6229

Battlefield Awareness and Data Dissemination (BADD) (Class I):
AT Staff: Mr. Thomas Perdue (703) 695-8045
Mr. Bob Beaton Demonstration Manager DARPA (703) 696-1122
Lt Col James Dorman Operational Manager USACOM J-36 (757) 322-5880

Combat Identification (CID) (Class III):
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Combat Vehicle Survivability (CVS) (CLASS I):
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Counterproliferation I (CPI) (CLASS III):
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Counter Sniper (CS) (CLASS II):
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Miniature Air-Launched Decoy (MALD) (Class II):
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Navigation Warfare (NAVWAR) (CLASS II):
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Semi-Automated Imagery Intelligence Processing (SAIIP) (CLASS I):
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Extending the Littoral Battlespace (ELB) (CLASS III):
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Line-of-Sight Anti-Tank (LOSAT) (CLASS II):
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Link-16 (CLASS I):
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Unattended Ground Sensors (UGS) (CLASS II):
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APPENDIX C: SURVEY RESULTS – ACTD CONTRACT TYPE SURVEY

(Only input from responding programs are included)

Type of Contract Vehicle	Class I	Class II	Class III	Totals
Modification to pre-existing contract	2		4	6
Omnibus Contract (Pre-existing)	1		2	3
Cost-Plus Fixed Fee (CPFF)	4	4	5	13
Cost-Plus Incentive Fee (CPIF)		2	1	3
Cost-Plus Award Fee (CPAF)		1		1
Other Transactions (OT)		1		1
In-House / Government provided	1		1	2
Indefinite Delivery/ Indefinite Quantity	1			1
Lease at Firm Fixed Price		1		1
Commercial Off-The-Shelf (COTS)	3			3
Fixed Price - Incentive (FPI)		1		1
Firm Fixed Price			1	1
Cost Share		1		1
Follow-on Options Included		3		3

Note: Some programs used multiple methods.

(Only primary or significant secondary methods were recorded.)

Source: Survey results from researcher conducted interviews.

(Table prepared by researcher)

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